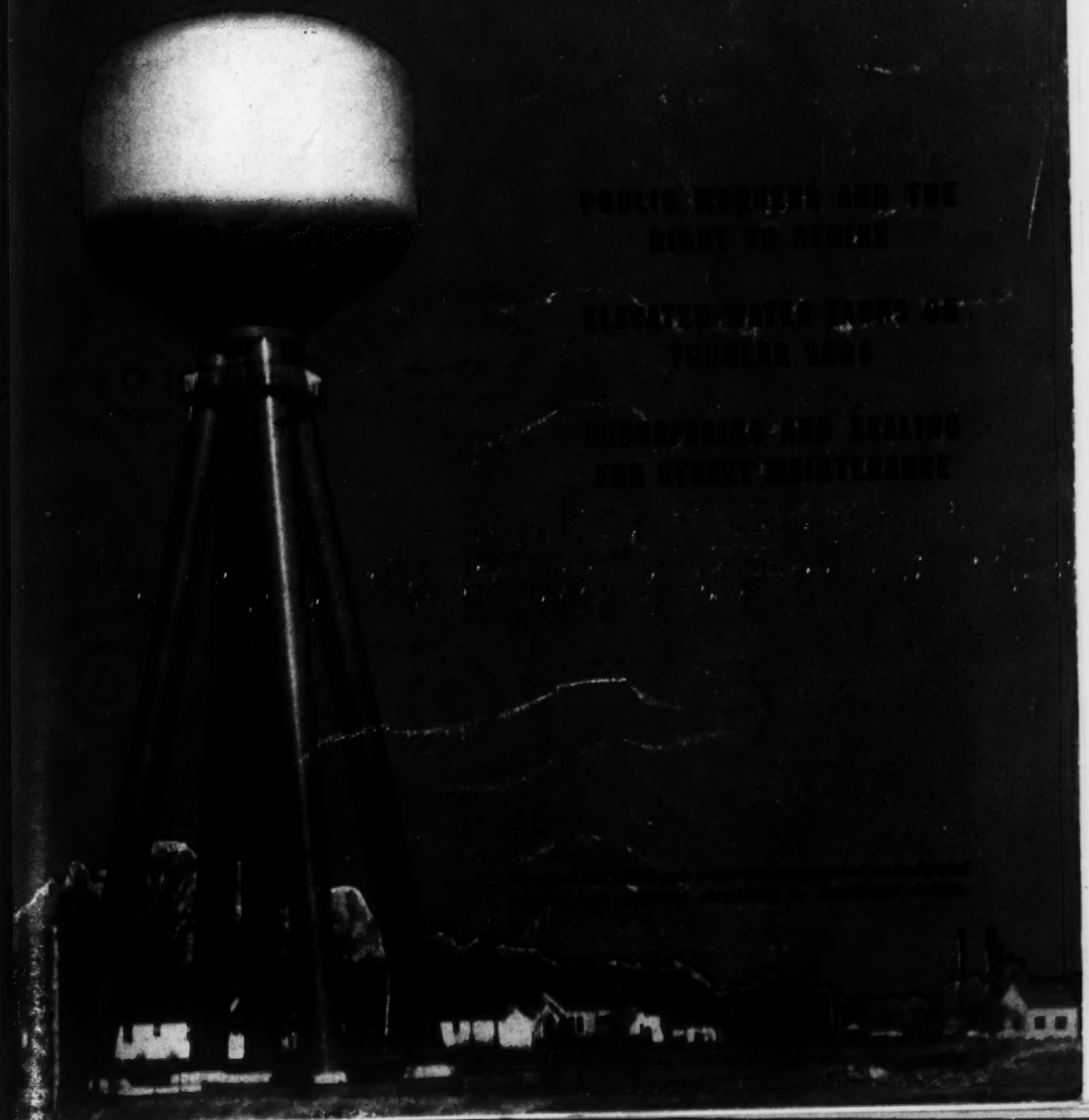
ENGINEERING NEWS-RECORD

SEPT. 5, 1946



As every engineer knows, a steam distribution system meets a variety of corrosive conditions. Some attack can be expected from the steam. Condensate is invariably aggressive. Overhead runs are exposed to the weather, and underground sections are surrounded by humid atmospheres that create unusually severe service conditions.

A round-up of all these hazards to service life faced the extensive steam distribution system recently installed at Denison University, Granville, Ohio. The heating plant provides steam for widely scattered campus buildings so that several miles of pipe were required for the installation. Part of the run is overhead, the balance underground. The engineers followed a time-tried method of combatting the corrosion threat; they installed Byers Wrought Iron for all distribution system supply and return piping. The same material was installed in a number of other services: condensate piping in boiler house and buildings; domestic hot water piping, underground and in buildings; overflow and drain piping in boiler house; and boiler blow-off piping.

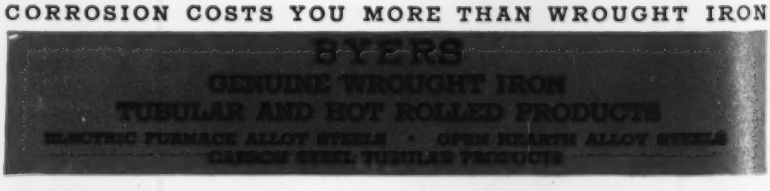
There is plenty of engineering evidence to support this choice of wrought iron. One classic example is an underground distribution system of 10" wrought iron pipe installed in Illinois shortly after the turn of the century. A few years later, a 16" wrought iron line was added. After 13 years use, the line was relocated. Only one length was badly corroded—and this was found to be low-first-cost material. The rest of the line was relaid and at last report, after 29 years of service, was still operating. No further maintenance had been required.

The reason for records like this is found in wrought iron's unique structure and composition. Tiny fibers of glass-like silicate slag, threaded through the body of high-purity iron, halt and diffuse corrosive attack, and so discourage pitting. The fibers also anchor the initial protective scale, which shields the underlying metal.

You will find some helpful information on eliminating repairs and maintenance in distribution systems in our bulletin, "Wrought Iron for Underground Services." We will be glad to send you a copy.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Seattle, San Francisco.

CORROSION COSTS YOU MORE THAN WROUGHT IRON



SCRAP NEEDED. *You can speed the production of materials you need by speeding your scrap through usual channels back to the metal producer.*

ENGINEERING NEWS-RECORD

Devoted to Buildings, Sewerage, Waterworks, Bridges, Roads, Dams, Foundations, Earthwork, Flood Control, Public Works, Airports, Irrigation, Canals, Tunnels, Railroads

Volume 137 • Number 10

September 5, 1946

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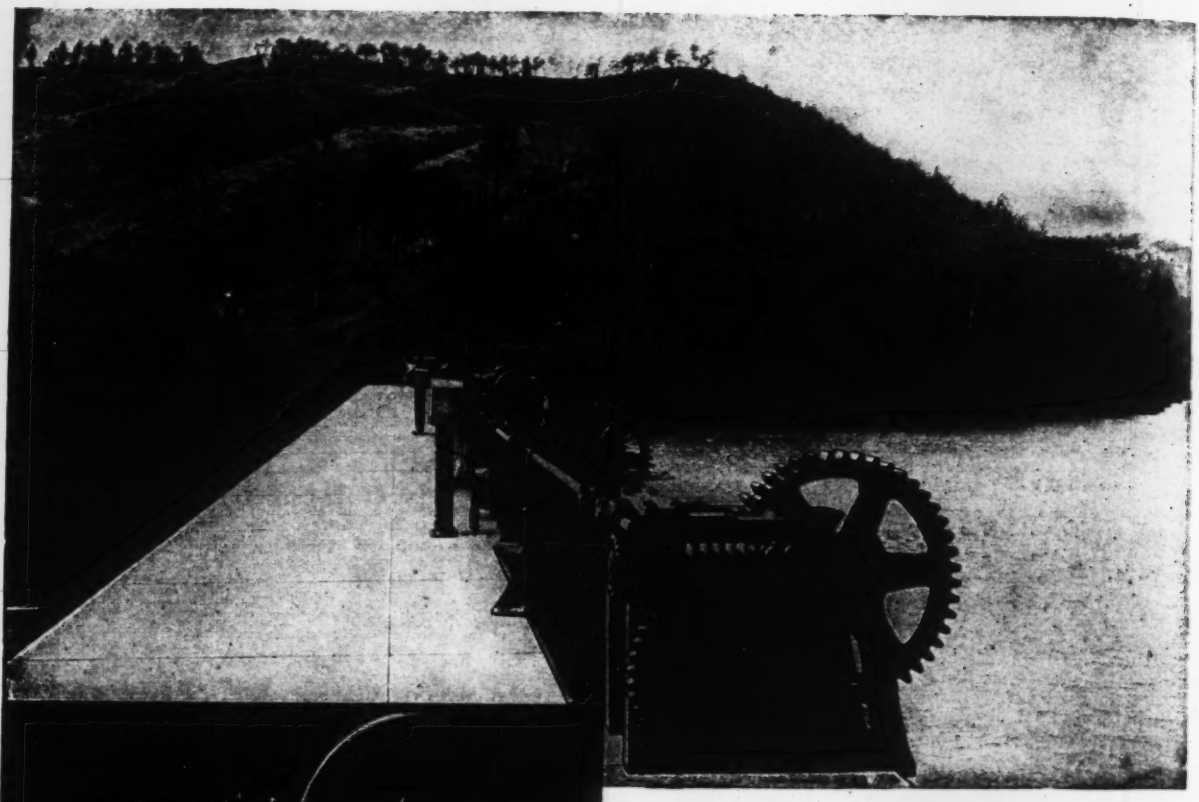
Number of copies of this issue printed 43,661

CHANGE IN PAGE SIZE

Engineering News-Record, along with other McGraw-Hill magazines, has gone back to an 8¼" x 11¼" page size starting with this issue. We regret that the paper shortage makes this change necessary at this time. We should have preferred, for the convenience of those who bind their issues, that the change be made in January. For the benefit of those who do bind their issues it should be said that issues September through December can be filled in at the stitching edge so as to equal the remainder of the year in width. The top and bottom margins of the first eight months are sufficiently wide to allow for trimming to the new length.



Hoists

THE PROBLEMS involved in hoisting mechanisms and gates are many and varied. The solution of them is almost a science in itself. Hence, as both are vital equipment of every water power plant, great care must be given to their selection.

Our experience of more than 72 years, covering all branches of hydraulic science and machinery building is at your disposal for discussion of your hoist and gate problems. It can be invaluable to you—not only as a guide in making your analysis, but in assuring you of maximum returns on your investment! Perhaps, one of our standard hoists will meet your needs, as our line is very complete. If not, furnished with full data on your problem and its characteristics, we can design and build the equipment exactly suited to your requirements. Write us.

If It's Hydraulics~ Put It Up to Us!

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Construction Trends

Construction a Year Ahead of Estimates

All estimates of the speed with which the construction industry could get its postwar construction program going have proved too conservative. The previous record increase of 50 percent over a preceding year has been dwarfed by the 200 percent increase that has raised engineering construction volume reported by *Engineering News-Record* to $3,169,000,000 for the first seven months of 1946. The early estimates for this year's total recorded volume, $3,400,000,000, now must be raised to $5,000,000,000, in spite of the federal construction moratorium affecting $700,000,000 in federal contracts. An all-time record is being set by 1946.

The proposed construction backlog, a continuing inventory by *Engineering News-Record*, has increased from $28,000,000,000 in December, 1945 to $32,572,000,000 in July, 1946, even after $700,000,000 was deducted as projects advanced to active contract status. As only 25 percent of the new construction contracts are coming out of this recorded backlog, the reserve of proposed construction projects is adequate to support the current rate of increase, then to sustain annual engineering construction volume of $10,000,000,000, the postwar planning objective for 1949, but now within reach for 1948.

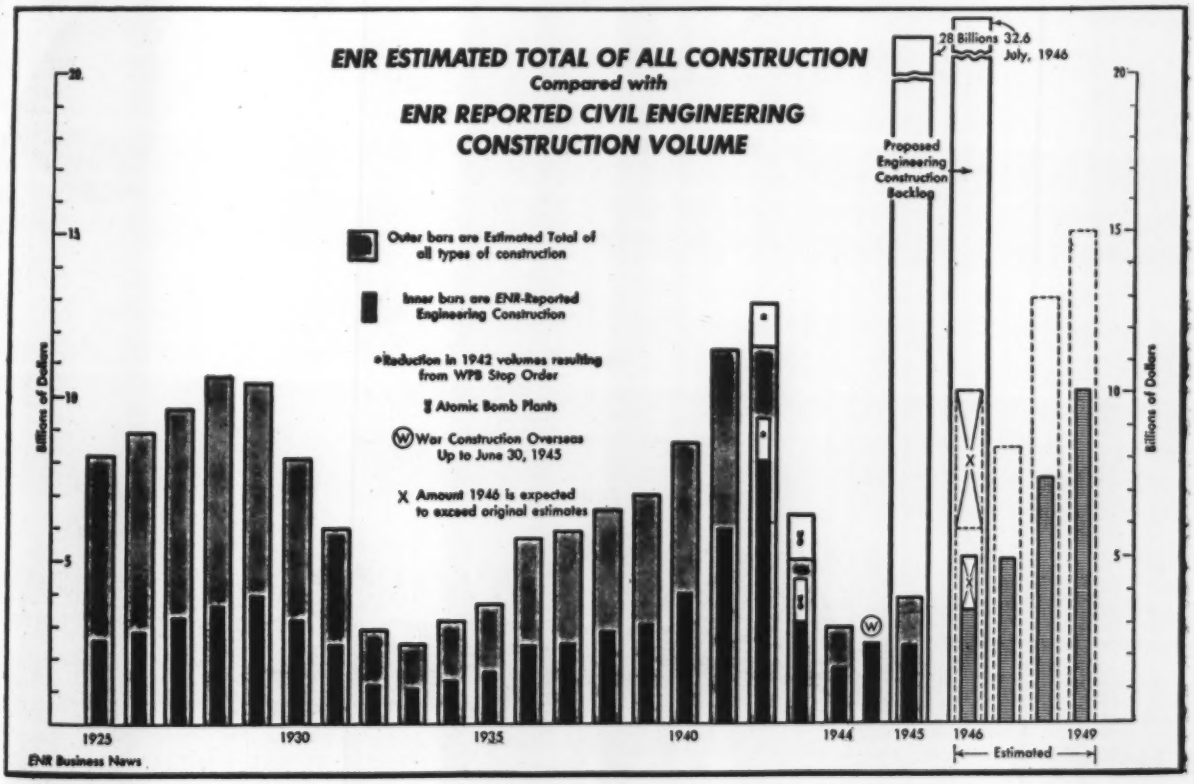
I. Engineering Construction Contracts
Reported by Engineering News-Record through July, 1946

	Cumulative		
Ownership	**1946**	**1945**	**% Increase**
Federal	$473,515,000	$574,872,000	−12
State and Municipal	779,792,000	173,618,000	+349
Total Public	$1,253,307,000	$748,490,000	+68
Total Private	1,915,473,000	298,649,000	+540
U. S. Total	$3,168,780,000	$1,047,139,000	+203
Type of Work			
Waterworks	$55,711,000	$25,112,000	+122
Sewerage	58,426,000	16,896,000	+246
Bridges	75,951,000	19,595,000	+288
Highways	449,661,000	121,639,000	+270
Earthwork, Waterways	270,581,000	23,538,000	+1,050
Buildings, Public	227,376,000	352,221,000	−3
Industrial	596,895,000	202,208,000	+195
Commercial	1,199,919,000	58,841,000	+1,939
Unclassified	234,260,000	227,089,000	+3

NOTE: Minimum size projects included are: waterworks and waterway projects, $22,500; other public works, $40,000; industrial buildings, $55,000; other buildings, $205,000.

II. Proposed Construction Backlog
Reported by Engineering News-Record through July, 1946

Waterworks	$1,064,000,000
Sewerage	1,782,000,000
Bridges	1,210,000,000
Earthwork, Irrigation, Waterways	7,485,000,000
Streets and Roads	3,962,000,000
Unclassified	5,542,000,000
Buildings, Public	6,726,000,000
Industrial	1,927,000,000
Commercial	2,872,000,000



ALL THESE JOBS *with* THIS ONE TOOL!

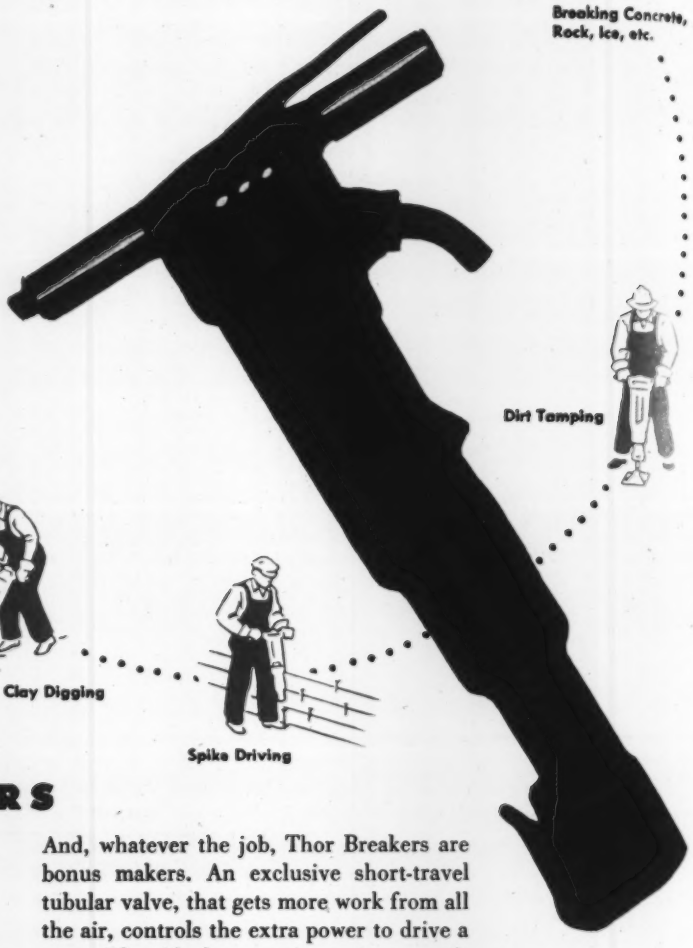
Asphalt Cutting

Sheeting Driving

Clay Digging

Spike Driving

Breaking Concrete, Rock, Ice, etc.



Dirt Tamping

Thor

PAVING BREAKERS

More than just a Buster is a Thor Paving Breaker! With moil points, chisels, wedges, and broaches in 7 styles it breaks concrete, rock, ice, and other materials. With wide-bladed spades it digs clay and hard-pan; cuts asphalt; splits timbers. With a tamper tool it pounds backfill. With an interchangeable Front Head it drives spikes. With another Head it drives sheeting.

And, whatever the job, Thor Breakers are bonus makers. An exclusive short-travel tubular valve, that gets more work from all the air, controls the extra power to drive a reversible, block-type piston in smooth blows. Rugged construction, full air-cushioning and automatic lubrication reduce wear. Get these benefits on your jobs now —ask your nearby Thor Distributor.

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New Construction Volume in August

Civil engineering construction volume in continental United States totals $541,325,000 for August, an average of $108,265,000 for each of the five weeks of the month. This average is 19 percent below the average for July, and is 153 percent above the average of August, 1945 according to *Engineering News-Record*.

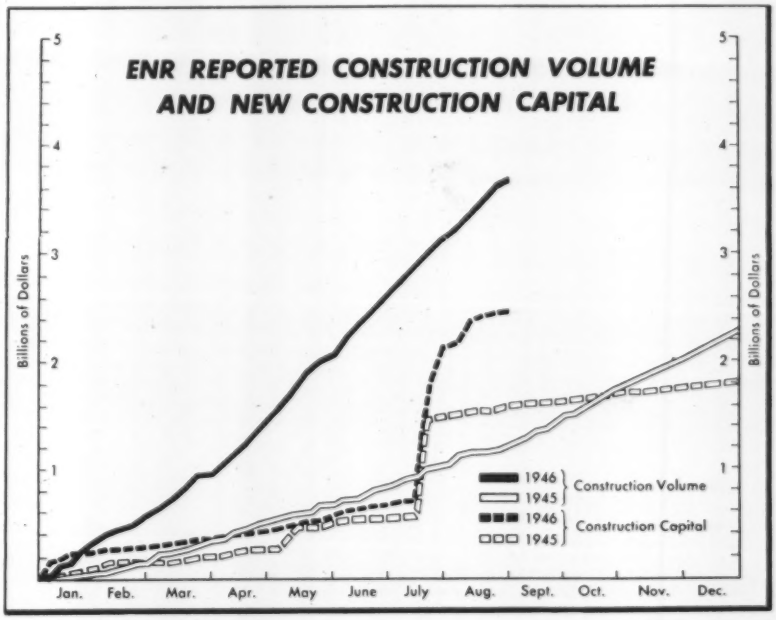
Private construction for August on a weekly average basis is 15 percent above last month, but 256 percent greater than August, 1945. Public construction is 46 percent below last month and 70 percent above last August. State and municipal construction, while 8 percent above last month, is 255 percent above the average for August, 1945. Federal construction, down 79 percent from last month, is 43 percent below the August, 1945 average.

Weekly averages in the various classes of construction for August, 1946 compared with July, show gains in industrial buildings of 10 percent; commercial buildings, 18 percent; public bridges, 17 percent; and waterworks, 3 percent; losses in highways, 18 percent; public buildings, 50 percent; sewerage, 33 percent; earthwork and drainage, 79 percent; public unclassified, 80 percent and private unclassified, 8 percent.

Geographically, four sections show gains in August, 1946 over July—Middle Atlantic, 34 percent; South, 7 percent; Middle West, 214 percent; and New England, 118 percent. West of Mississippi dropped 61 percent below and Far West, 46 percent.

All sections made gains in August over August, 1945 as follows: New England, 272 percent; Middle Atlantic, 389 percent; South, 256 percent; West of Mississippi, 44 percent; Middle West, 52 percent; and Far West, 72 percent.

New capital for construction purposes for the five weeks of August, 1946 totals $320,066,000, or a weekly average of $64,013,200, 83 percent below the July average and 176 percent above the average for August, 1945.

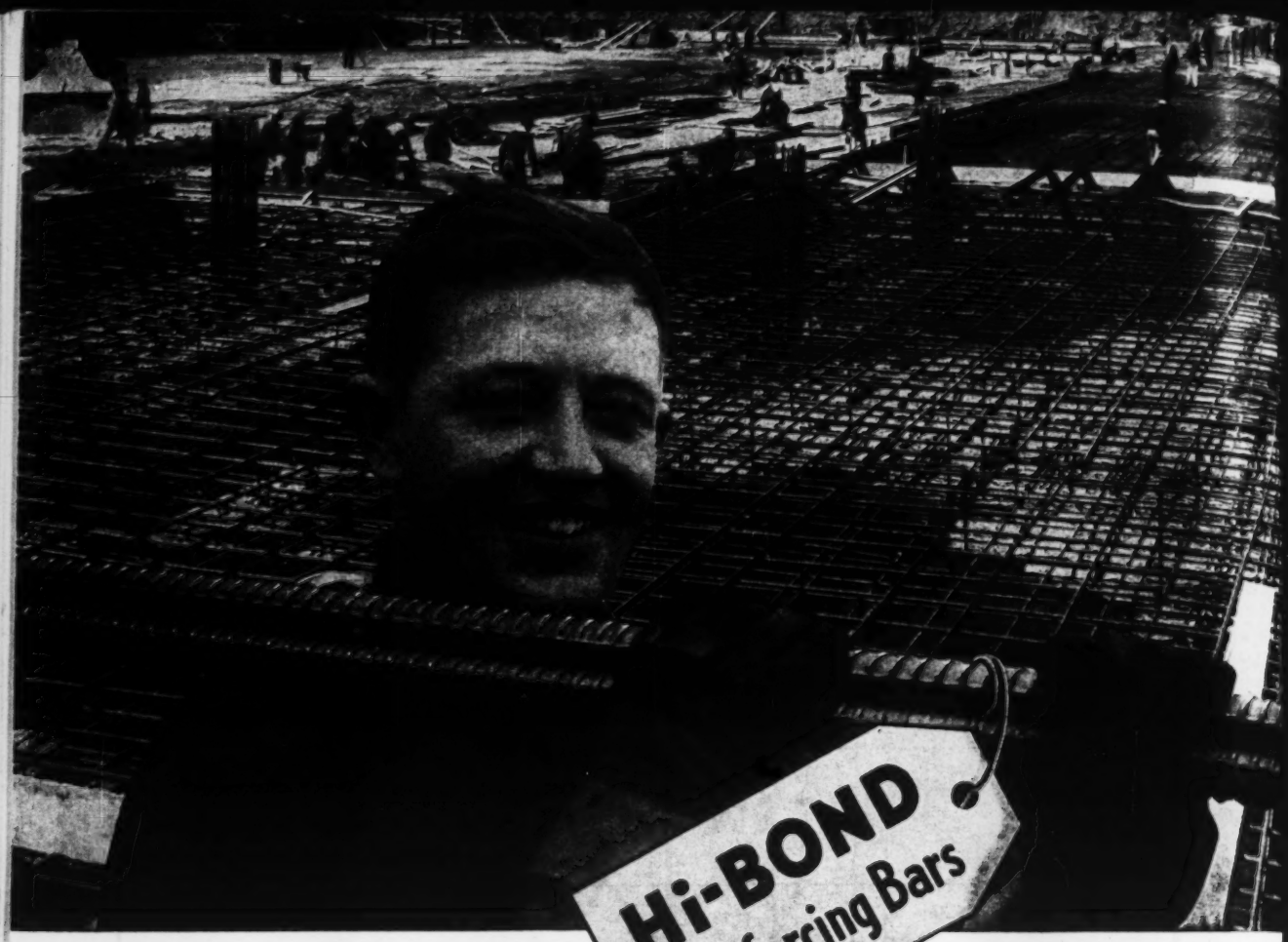


ENGINEERING CONSTRUCTION CONTRACTS REPORTED TO ENGINEERING NEWS-RECORD—AUGUST, 1946

Engineering News-Record *reports continental U. S. Construction projects of the following minimum costs — Waterworks, excavation, drainage and irrigation,* $22,005; *other public works,* $40,000; *industrial buildings,* $55,000; *other buildings,* $205,000

Five Weeks — Thousands of Dollars (000 Omitted)

	New England	Middle Atlantic	South	Mid West	West of Mississippi	Far West	United States August 1946	United States Eight Months 1946	United States Eight Months 1945	Canada
Public Works										
Waterworks	566	5,122	2,042	1,352	1,539	2,378	**12,999**	**69,299**	35,416	345
Sewerage	351	1,533	965	1,590	2,026	3,495	**9,960**	**67,797**	21,440	517
Bridges, public	6,628	1,167	2,511	2,730	2,393	2,215	**17,644**	**92,124**	18,581	50
Earthwork and waterways	23	658	1,055	1,421	5,911	10,488	**19,556**	**290,137**	33,016	1,307
Streets and roads	4,888	14,696	24,007	19,409	18,967	10,974	**92,941**	**542,602**	147,137	8,907
Buildings, public	1,200	7,042	13,271	6,687	5,420	6,807	**40,427**	**267,803**	399,922	3,270
Unclassified, public	834	3,198	1,431	325	1,243	1,667	**8,698**	**125,770**	211,676	489
Total public	**14,490**	**33,416**	**45,282**	**33,514**	**37,499**	**38,024**	**202,225**	**1,455,532**	**867,188**	**14,885**
Federal government (incl. in above classifications)	113	1,348	9,851	3,050	7,652	19,220	**41,234**	**514,749**	648,308	.....
Private										
Bridges, private	.....	40	.....	.....	.....	.....	**40**	**1,511**	3,806	.....
Industrial buildings	4,320	12,805	28,618	11,672	12,562	26,645	**96,622**	**693,517**	263,686	6,498
Commercial buildings	22,026	134,372	29,418	6,655	15,919	23,070	**231,460**	**1,431,379**	78,005	9,237
Unclassified, private	780	205	2,448	2,765	4,645	135	**10,978**	**128,166**	48,414	1,661
Total private	**27,126**	**147,422**	**60,484**	**21,092**	**33,126**	**49,850**	**339,100**	**2,254,573**	**393,911**	**17,396**
Total Engineering Construction:										
August, 1946 — 5 weeks	**41,616**	**180,838**	**105,766**	**54,606**	**70,625**	**87,874**	**541,325**	.....	.....	**32,281**
July, 1946 — 4 weeks	15,274	107,847	79,068	57,388	146,014	131,003	**536,594**	.....	.....	26,793
August, 1945 — 5 weeks	11,188	36,976	29,733	35,816	49,208	51,039	**213,960**	.....	.....	19,658
Eight Months — 1946	**216,938**	**889,133**	**525,265**	**421,334**	**751,391**	**906,044**	.....	**3,710,105**	.....	**224,613**
Eight Months — 1945	58,700	182,438	214,646	198,008	278,976	328,331	.....	.....	1,261,099	98,796



Contractor reports that Hi-Bond from Ryerson stocks, used exclusively on this job, simplifies tying, yet gives firmer framework, because of gear-like contact between scientifically designed bars.

Designed for Greater Anchorage in Concrete Construction

Shipped Promptly from Ryerson Stocks

Here's a combination that always gives top performance—Hi-Bond bars plus Ryerson reinforcing service. As with other steel products today the needed size or quantity of Hi-Bond has sometimes been difficult to obtain. But all Ryerson plants offer service on a wide range of construction steels and Ryerson plants in Chicago, Detroit and Cincinnati regularly stock Hi-Bond rounds in sizes from ⅜ to 1.53 inches (1¼" square equivalent) and greater tonnage should be available before long.

More and more engineers are specifying Hi-Bond because laboratory tests conclusively prove that scientific Hi-Bond design creates a greater bonding grip with concrete. This means better, stronger construction and an increased resistance to the formation of tensile cracks.

More and more contractors are using Ryerson reinforcing service because Ryerson handles the complete job from setting plans to delivery with speed and accuracy. Bars are cut, bent and correctly tagged for easy placement. Ryerson deliveries are completely flexible to the changing needs of the job schedule.

If you have been unable to secure reinforcing from Ryerson stocks during the present steel shortage we suggest you try again. You will be pleased with the time and trouble saving advantages of Ryerson service. And remember Ryerson stocks of the unique Hi-Bond bar when planning new construction.

In addition to Hi-Bond, Ryerson stocks include a broad range of other construction steels—structurals, plates, steel spirals, reinforcing accessories, forms for concrete joist construction, bolts, rivets, etc. Write for Stock List.

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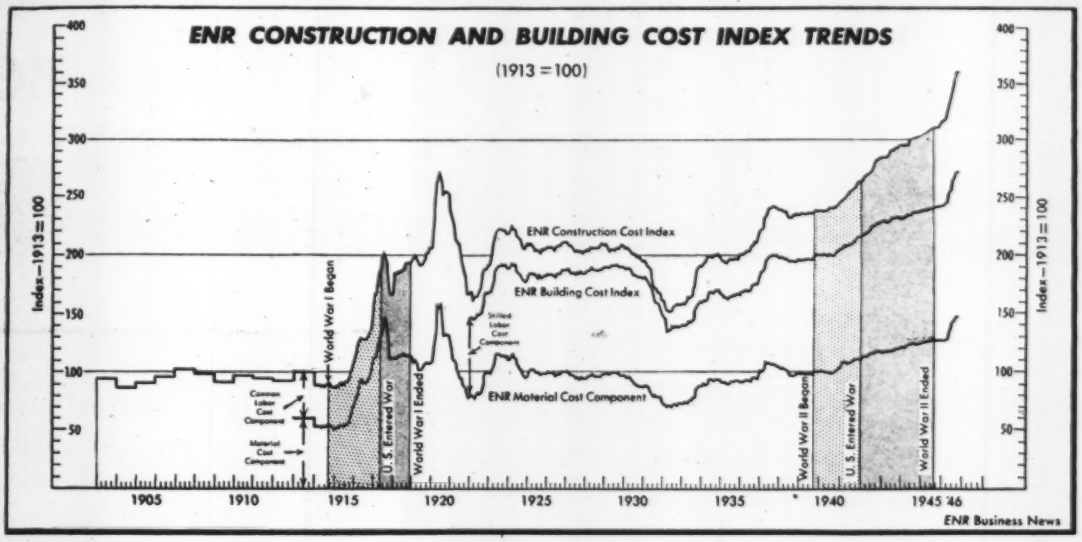
RYERSON STEEL

SEPTEMBER CONSTRUCTION BUSINESS REPORT



ENR CONSTRUCTION VOLUME AND NEW PRODUCTIVE CAPITAL

Thousands of Dollars (,000 omitted)	August 1945 (5 wk.)	August 1946 (5 wk.)	% Change	Eight Months 1945 (35 wk.)	Eight Months 1946 (35 wk.)	% Change
Total U. S. Construction	$213,960	$541,325	+153	$1,261,099	$3,710,105	+194
Private Construction	95,262	339,100	+256	393,911	2,254,573	+472
Public Construction	118,698	202,225	+70	867,188	1,455,532	+68
Federal	73,436	41,234	−44	648,308	514,749	−21
E N R Construction Volume Index, 1913 = 100	119	258	+117	101	271	+168
Total New Productive Capital	$116,063	$320,066	+176	$1,601,763	$2,499,395	+56
Private Investment	71,490	145,252	+103	388,265	899,529	+132
Federal (non-federal work)	.....	.....	.....	163,600	225,000	+38
Federal (federal work)	44,573	174,814	+292	1,049,898	1,374,866	+31

CONSTRUCTION . . . . WAGE RATES . . . . MATERIAL PRICES

1913 = 100	September 1945	September 1946	% Change	Change August to September 1945 August	1945 Sept.	%	1946 August	1946 Sept.	%
E N R Constr. Cost Index†	309.28	360.19	+16.46	309.08	309.28	+0.1	361.37	360.19	−0.33
E N R Building Cost Index†	240.07	272.04	+13.32	239.94	240.07	+0.1	271.98	272.04	+0.02

† Does not reflect increased costs due to overtime, lower labor efficiency, delivery delays, etc.

ENR 20-CITIES' AVERAGE

Common Labor	$0.917	$1.072	+16.90	$0.916	$0.917	+0.1	$1.071	$1.072	+0.09
Skilled Labor (Av.3 Trades)	1.67	1.846	+10.54	1.668	1.67	+0.1	1.824	1.846	+1.21
Bricklayers	1.77	1.962	+10.85	1.77	1.77	0	1.948	1.962	+0.72
Structural Ironworkers	1.72	1.860	+8.14	1.72	1.72	0	1.825	1.860	+1.92
Carpenters	1.519	1.724	+13.50	1.515	1.519	+0.3	1.706	1.724	+1.06
Cement, per barrel	2.75	2.909	+5.78	2.75	2.75	0	2.856	2.909	+1.86
Reinforcing Steel, cwt	2.79	3.370	+20.79	2.79	2.79	0	3.343	3.370	+0.81
Structural Steel, base	2.10	2.350	+11.90	2.10	2.10	0	2.350	2.350	0
Sand, per ton	1.24	1.501	+21.05	1.24	1.24	0	1.499	1.501	+0.13
Lumber, 2x4 Fir, per M ft.	55.63	69.947	+25.74	55.63	55.63	0	68.925	69.947	+1.48
Lumber, 2x4 Pine, per M ft.	53.84	63.418	+17.79	53.84	53.84	0	67.181	63.418	−5.60
Common brick, per M	18.98	22.055	+16.20	18.78	18.98	+1.1	21.70	22.055	+1.64
Read-mixed concrete, c.y.	7.66	8.283	+8.13	7.66	7.66	0	8.242	8.283	+0.50
Struct. clay tile, 3x12x12	85.07	98.232	+15.47	85.07	85.07	0	98.229	98.232	‡

‡ Less than .005 percent change.

MATERIAL SHIPMENTS . . . . BUILDING PERMITS

	August 1945	August 1946	% Change	July 1946	% Change July to August
Steel (% Operating Capacity) A. I. S. I.	78.7	89.6	+14	88.4	+1

	June 1945	June 1946	% Change	Six Months 1945	Six Months 1946	% Change
Cement, thous. bbl. U. S. B. of Mines	10,083	14,558	+44	43,682	73,953	+69

	July 1945	July 1946	% Change	Seven Months 1945	Seven Months 1946	% Change
Fabricated Structural Steel, tons, A. I. S. C.	51,465	130,980	+155	401,343	778,845	+94
Building Permits, 215 Cities, Dun & Bradstreet (,000 Omitted)	$89,001	$213,589	+140	$493,755	$1,700,819	+244

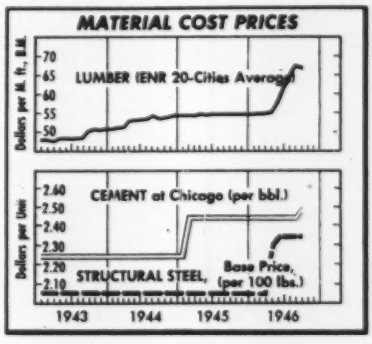
COST OF LIVING INDEX . . . . EMPLOYMENT

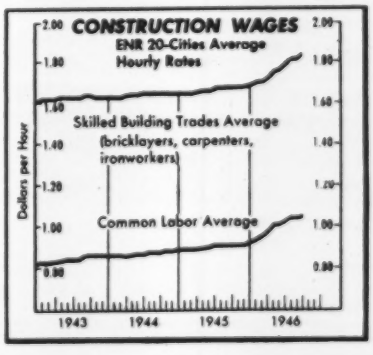
	July 1945	July 1946	% Change	June 1946	% Change June to July
Consumers' Price Index, B L S	129.4	141.0	+9.0	133.3	+5.8
Rent (Housing) Index, B L S	108.3	108.5	+0.2	108.5	0

	July 1945	July 1946	% Change	June 1946	% Change June to July
Const. Employment (est.), thous., B L S	1,043	2,250	+115.7	2,130	+5.6
Private Constr. Employ. (est.), thous., B L S	724	1,887	+160.6	1,828	+3.2

ENR INDEX NUMBERS

Base = 100	Construction Cost 1913	Construction Cost 1926	Building Cost 1913	Building Cost 1926	Volume '13	Volume '26
Sept., 1946	360.19	173.14	272.04	147.06	...	...
Aug., 1946	361.37	173.71	271.98	147.02	258	113
July, 1946	353.89	170.11	266.13	143.86	327	144
June, 1946	347.91	167.24	264.16	142.80	344	151
May, 1946	339.69	163.29	257.25	139.06	284	125
April, 1946	334.59	160.83	254.37	137.50	340	149
Mar., 1946	323.83	155.66	245.41	132.66	256	112
Feb., 1946	319.52	153.59	243.94	131.86	167	73
Jan., 1946	316.32	152.05	242.23	130.94	189	83
Dec., 1945	313.48	150.69	240.82	130.18	163	71
Nov., 1945	309.28	148.67	240.55	130.00	173	76
Oct., 1945	309.28	148.67	240.35	129.93	167	73
Sept., 1945	309.28	148.67	240.07	129.77	164	72
Aug., 1945	309.08	148.57	239.94	129.70	119	52
1945 (Av.)	307.74	147.93	239.14	129.27	123	54
1944 (Av.)	298.63	143.39	234.73	126.89	95	42
1943 (Av.)	289.95	139.38	228.75	123.66	176	77
1942 (Av.)	276.31	132.82	222.39	120.22	553	243





Chicago Housing Project used Duraplastic in Structural Frames

Second unit, Princeton Park Housing Project, Chicago; Holsman & Holsman & Klekamp, architects, Chicago

ON THIS HOUSING UNIT of 107 buildings, concrete was made with Atlas Duraplastic air-entraining portland cement.

The superintendent reports that concrete "was very plastic and workable ... flowed easily, aiding placement ... showed no segregation or bleeding ... well pleased with final results."

Duraplastic cement complies with ASTM specifications and sells at the same price as regular cement. It provides the proper amount of entrained air by intergrinding with the cement the precise amount of air-entraining material needed for satisfactory field performance.

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ENR-D-39

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News of the Week

ENGINEERING NEWS-RECORD • SEPTEMBER 5, 1946 • VOLUME 137 • NUMBER 10

Order puts most materials under tight federal control

Channeling as much as 75 percent of all building materials to housing is aim—Tightening of restrictions on non-residence construction also to be enforced

Comprehensive new controls aimed at channeling as much as 75 percent of the output of many critical building materials into housing work were placed in effect Sept. 1 by the National Housing Agency and the Civilian Production Administration.

NHA is also taking over from CPA the work of enforcing all construction controls except those on industrial work; before the end of the year all construction regulations are expected to be placed under NHA supervision.

The total volume of construction for 1946, scheduled at nearly $16 billion (Page 75 of this issue) may not be reduced by the new controls, because the volume is considered primarily limited by the availability of materials and supplies. Therefore, the federal agencies plan to reduce industrial construction, especially such types of work as theaters, stores, and offices, to permit a greater volume of housing to go forward. The plan is to limit the volume of approvals of non-residential construction to $35,000,000 weekly, which compares to the current rate of $48,000,000.

The new program calls for major changes in some of the existing construction regulations. January 15 of this year the CPA issued Priorities Regulation 33 which originally set aside a percentage of eleven critical building materials for priority distribution to aid housing (*ENR* Jan. 10, vol. p. 13). On March 26 followed the comprehensive Veterans Housing program Order 1 (VHP-1).

From time to time both orders were amended with the most important changes being amendments to Schedule A of PR-33 to increase the number of building materials under priority distribution. The normal priority procedure consisted of issuing an MM rating to a builder to get supplies for an essential military project, an AAA priority for a job of national importance, a CC priority for commercial projects other than housing and an HH aid for essential home construction. The last two ratings were of equal standing. A few weeks ago a new rating of HHH came into force to help in the program calling for the reuse of 200,000 temporary war housing units.

The plan is now to keep VHP-1 in force, but to require that the local CPA committees tighten up on non-residential construction. At the same time PR-33 is being amended by modifying Schedule A by adding a long list of new materials to be under priority, and by adding to PR-33 a new Schedule B, severely tightening the controls on distribution of priority materials.

In all, 57 types of materials are now to be distributed under priority control. Up to 75 percent of the production of 43 of these materials will be distributed through priority channels, and even larger portions for the remaining 14 types of building supplies. Seventy-five to 80 percent of all lumber produced must be set aside, 85 percent of the millwork, 100 percent of all hardwood flooring, and 85 percent of softwood plywood.

Ten other materials where the set-aside is 75 percent or above and the percentage of each to be distributed by priority, are: Bathtubs, 95; kitchen sinks, 75; lavoratories, 90; water closets, tanks and bowls, 90; cast iron soil pipe and fittings (under 5 in.), 80; clay sewer pipe, 75; gypsum board and lath, 85; building board and lath, 75; warm air furnaces, 75; and radiation, 75 percent.

Many new materials added

New materials added to Schedule A or PR-33 with up to 75 percent of the total output to be distributed by priority include; Gutter and downspouts; metal and plastic insect screen cloth; metal cabinets for kitchens and bathrooms; metal weather stripping; oil burners and domestic stokers; plumbing fixture fittings; rigid flexible and other types of raceways; septic tanks, and steel joists.

Also, oil and water storage tanks up to 550 gallons in capacity; caulking lead; copper water tubing; steel and wrought iron pipe, including galvanized, 3/8 to 4 in. in diameter; structural steel and aluminum shapes; asbestos cement siding; concrete reinforcing bars and finishing lime.

(*Continued on page* 71)

Cost of Deer Creek work $6 million over estimate

Cost of the Deer Creek irrigation project in Utah will reach $19,443,650, more than $6,000,000 above previous estimates, the Bureau of Reclamation reported.

Fisher Harris, Metropolitan Water District counsel, is working with the federal agency to hurry the execution of new contracts to allow beneficiaries of the Deer Creek division of the Provo River project to guarantee repayment of the new total.

The authorized $13,150,000 will be spent by December and the bureau must halt construction at that time if necessary elections and contracts have not been completed.

Canada to develop the Alaskan highway

When the estimates for the Department of National Defense of Canada were under review recently in the House of Commons, it was stated that the government has under consideration the development of the Alaska highway as a tourist and commercial venture.

Maintenance of the highway is now the responsibility of the Royal Canadian Engineers. Canadian engineers went to the highway before it was officially taken over last April, and $183,000 had been spent on work up to that time. The official estimates called for a sum of $5,206,736 to cover all expenses for the present fiscal year.

NEWS IN BRIEF

In telegraphic form, here are latest news developments on the engineering and construction front during the week.

Construction—The University of Tennessee will build a $950,000 dormitory at *Knoxville*. . . . Construction has started on a $2,000,000 plant for the Victor Chemical Co. at *Tarpon Springs, Fla.* . . . Willard Storage Battery Co. has plans for a $500,000 manufacturing plant at *Portland, Ore.* . . . American Radiator & Standard Sanitary Corp., Pittsburgh, Pa., has announced it will build a $3,500,000 plant in *Richmond, Calif.*, for manufacture of plumbers' brass fixtures. . . . Southern California Telephone Co., *Los Angeles*, has begun construction of a new $2,000,000 10-story building. . . . *Philadelphia, Pa.* city council voted $3,000,000 to build additions and renovize 17 city playgrounds. . . . CPA authorized $400,000 of modernizing and repair work at Byberry State Hospital, *Philadelphia, Pa.* . . . A $3,000,000 racetrack will be built at *Puente, Cal.* . . . *Atlanta, Ga.*, is planning construction of a 100,000-seat athletic stadium to cost more than $1,000,000.

Housing—New dwellings completed in *Atlanta, Ga.*, since Jan. 1 total more than 4,000 with another 4,000 units under construction and approximately 7,000 more projected, according to a recent survey by Regional Housing Expediter Clarence N. Walker. Angus A. Alberson, local contractor has disclosed plans for the construction of 452 houses at a total cost of $6,000,000, most of them in the $15,000 class. . . . At *Philadelphia, Pa.*, Mai Win Corp. will build a $100,000 development and the Orleans Construction Co. a 900-residence $6,000,000 development. . . . At *Milwaukee, Wis.*, a $1,786,000 housing project for Negroes will be built.

Highways—Contracts for $4,706,702 worth of road construction have been awarded this year by the *Idaho* state highway department, and it plans to award an additional $4,000,000 in contracts during the balance of the year. U. S. Highway 169 near *Coffeyville, Kan.*, is being rerouted. . . . On Aug. 16 the *Alabama* State Highway Department received low bids on road projects totalling $3,448,740. . . . On Aug 15 *North Carolina* received bids totaling $2.333,091 for resurfacing 210 miles of roads. . . . Contracts are expected to be awarded soon for 13 highway bridges in *Virginia*. . . . For the second time, bids submitted to the Public Roads Administration office at *Portland, Ore.*, for construction of a highway relocation project in the Williamette national forest of Oregon have been rejected as too high. . . . Street paving projects in *Baltimore, Md.*, costing over $730,000 are scheduled for early completion. . . . The *Mississippi* State Highway Department has awarded approximately $9,000,000 in contracts since the first of the year.

Sewers and Water Supply—The *Pennsylvania* State Sanitary Water Board has ordered 46 more industrial organizations to prepare plans and build sewage plants; bringing to 512 the number of municipalities and industrial firms so ordered. . . . Engineers and attorneys of *Phoenix, Ariz.*, and *Salt River Valley* Water Users Association will start a joint study immediately to determine water use by the municipality in the proposed $4,500,000 water development program of the city. . . . Governor Dwight H. Green of Illinois announced Aug. 22 the release of $305,000 for the construction of flood control sanitary works along Hickery Creek, near *Joliet*.

PERSPECTIVE . . . .

Curtailment Orders

Facing the reality that construction material supplies are running far behind current demand from all quarters, the federal government last week took its third step in drastically curtailing construction other than housing and its necessary services (p. 69 this issue).

Although more than half the year—and with it much of the best construction season—is gone, it is as yet difficult to assess the effects of these orders, although it seems obvious that deep cuts may be made in the many governmental and other estimates of total construction value for the year which reached a (forecast) high of $17,000,000,000.

Certainly, the curtailments have not as yet materially helped the supply picture, as witness the latest report of the Department of Commerce (page 71 this issue) which confirms previous reports in this journal that production is far behind demand. Beset by the manifold troubles of reconversion, many-sided strikes, loss of labor productivity and other problems the manufacturing and distribution elements of the construction industry are striving hard—but seem to have little prospect of catching up with demand for months to come.

A partial solution of the problem lies in two moves: The first—dictated by economics textbooks—is that government spending should be held to a minimum in time of inflation and general prosperity; and the second is a drastic control of the construction of anything other than housing.

Foreseeing the shortage in materials and labor, NHA and CPA jointly took the first step on March 26, ordering virtually shutdown on all construction other than housing and the services that housing needs (water systems, sewers, streets, etc.). The program provided opportunities for many types of heavy construction to proceed—on the theory that facilities to produce essential materials and give employment would be necessary. By May, this order had apparently checked the upward spiral of private construction—leveling it off at a rate of about $80,000,000 weekly. And in a report released last week, CPA said that since the order went into effect, it has disapproved more than $1,773,900,000 worth of non-housing work.

On Aug. 6, in response to a suggestion contained in President Truman's budget message to Congress, CPA issued its second drastic order—this time aimed at government construction agencies. The order required that all new federally-financed construction be held up for a 60-day period, and that all agencies review their construction plans with an eye toward deferment or drastic cuts. As of last week, Public Roads Administration, the Army Engineers, the Bureau of Reclamation and other agencies had not drawn up listings of what work would continue or be stopped in deference to the order, although PRA had informed state highway departments that work already committed could continue.

And on Aug. 27, the original CPA-NHA curtailment order on non-residential building was reinforced by a further 27 percent cut, and by revising priority schedules to place more materials under tighter control for channeling into housing. Net result of this latest order is that about 57 percent of all applications for non-housing construction are now being turned down in the NHA offices. . . . *EEH*

Commerce Department report notes building material production rise

Most key materials, however, will not meet expected demand, survey shows—Confirms earlier surveys

Although production of most key construction materials registered substantial increases in the first half of 1946 as compared with a similar period in 1945, it has still failed in most categories to meet demand, according to a monthly report released last week by the Department of Commerce.

The report confirmed the trend noted in *Engineering News-Record's* surveys of August 1 and June 27, and of a recent report by the Civilian Production Administration (*ENR* August 8, vol. p. 147).

The commerce report said, for example, that lumber output will pass the 32 billion b.ft. goal set for 1946; millwork has increased: hardwood flooring production topped 128,649,000 b.ft., and softwood plywood production for the first six months of the year was 685,000,000 sq. ft.—but despite the fact that these figures represent increases (excepting for plywood) the production will be "short of meeting anticipated demand."

Steel production—with the industry operating at nearly 85 percent of capacity in July, compared with 75 percent in June—was 7,598,864 tons of ingots. But the high rate of production was expected to fall off soon, owing to continued shortages of pig iron and scrap. Producers are "far behind" in commitments, the report said.

June production of clay sewer pipe, structural clay tile, vitrified paving brick and in clay products generally was higher than in previous months and higher than that of 1945, but supplies will continue "tight" owing to heavy order backlogs and increasing demand.

Cement production rose to 14,489,000 barrels in June, for a 19 percent increase over the preceding month and 62 percent over that for June, 1945. Although production of concrete building block has increased each month this year as a result of increasing machine capacity, output continues "inadequate," the report continued.

Cast iron soil pipe production decreased by 18 percent from May output, with unfilled orders equalling about 12 months production at the estimated June rate of 26,500 tons. Gypsum board and lath shipments increased slightly during the second quarter of 1946 to a total of 725,000,000 sq. ft.

Nail production low

June shipments of nails were estimated at 53,000 tons—about 100 tons more than were shipped in May. Production for the first six months of 1946 was estimated at 264,000 tons, with an average monthly rate of 44,000 tons—far below the 1945 figure of 53,500 tons per month.

Metal insect screen cloth was expected to remain "critically short" into 1947, and production of plumbing fixtures remains "inadequate to fill requirements, owing to continued shortage of pig iron and sheet steel."

Materials put under federal control

(*Continued from page* 69)

NHA is also taking major steps to assure that approvals are sought for all construction projects above the minimum cost ceiling and to assure that distributors and materials dealers follow priority and distribution regulations. In this work they are transferring the enforcement controls for all construction other than industrial work from CPA to the Office of Price Administration. In contrast to CPA's limited enforcement staff, OPA has 500 area rent offices scattered throughout the country and a much more vigorous enforcement of the regulations is planned and will be possible.

Other steps are taken

Other recent steps taken to advance the housing program are issuance of a new order prohibiting the use of cast iron soil pipe beyond 5 ft. from the building line, and a new control limiting cast iron soil pipe producers' non-housing output to 7 percent of his previous month's tonnage.

Result of all of the new additions and tightening of control is that residential builders will be assured they can obtain supplies, once a project is started, according to the NHA. The NHA plans that 95 percent of the materials set aside for priority distribution will now go into housing through the use of the HH rating, with MM, CC and AAA ratings to be used very sparingly.

All priorities and approvals previously obtained under PR-33 will remain effective. Therefore, no jobs previously authorized will be shut down by withdrawal of priorities.

Administrator Wyatt of the NHA has also announced that effective Sept. 10 all new applications for HH priority for housing will be filed under a new regulation known as Housing Expediter Priorities Regulation No. 5, instead of under PR-33. After this change occurs, the constituent units of NHA—the Federal Housing Administration and the Federal Public Housing Authority—will process the applications.

Ohio cities delay work because of shortages

Because of increased costs of labor and materials, Cleveland, Ohio, officials plan to hold back all but the most essential public work, and work to be done this year in the city's $35,350,000 capital improvements program will be largely that which has not been affected too severely by rising costs. The city service department will have $1,000,000 worth of work under contract before the end of the year, to include $558,000 worth of paving; $363,000 worth of sewer improvements; $289,000 of bridge improvements; and $136,000 for the landing strip at Cleveland Airport. The city is issuing $500,000 in bonds for recreation facilities and $400,000 for park improvements, but Proctor Noyes, planning co-ordinator, said the city would not accept any bids that seemed unreasonable.

Columbus also delays building

Columbus will spend little on its $8,000,000 improvement program this year, most of it being scheduled for completion in three or four years. This is partly due to a materials shortage and partly because of the unwillingness of contractors to enter into an agreement unless provisions are approved for upward adjustments if prices rise. This year's work was to include building some fire engine houses, sewer improvements, and possibly the extension to the sewage treatment works. Voters approved $500,000 for engine houses, but no decision on sites has been reached. A $2,000,000 extension to the sewage disposal plant is awaiting a report on the best treatment process available. Plans for a few storm and sanitary sewers authorized under the $3,500,000 sewer bond issue approved are being prepared.

RANDOM LINES *from an editor's notebook*

in which an engineering editor finds it very difficult to get away from engineering—even on a long vacation tour

"Getting away from it all' is a fine slogan for a vacation—but its application is less than perfect to an editor interested in civil engineering and construction. Try Denver, gateway to one of our great vacation lands, and on July 16 they are breaking ground for Cherry Creek Dam. Go farther, into Estes Park, and construction operations on the Colorado-Big Thompson project to divert water under the Continental Divide break the mountain stillness even on the backwoods horse trails. Across the divide in the Grand Lake area, more of this same project in the form of reservoir building is forced upon the vacationist's attention.

Perhaps it is only the Colorado Rockies that are having growing pains? Try the mesa lands of the Sangre de Cristo Range near Santa Fe. But within a mile of the ranch, New Mexico State Highway 3 is being relocated by a major earthmoving operation, and across the valley the lights of Los Alamos are plainly visible, illuminating as it were the problem of getting more water for this famous atom bomb community—a problem being solved by an 8½-mile pipeline from the Rio Grande. Even in picturesque Santa Fe where you go every day or two to vary the routine, (and let your family shop for Indian jewelry) you are confronted with the town's talk of its water crisis.

You never quite succeed in getting away from civil engineering and construction, and finally admit that it would have been a dull holiday if you had. Moreover, as a consequence there was no shock of reconversion when, after the vacation ended, you found yourself in San Francisco in the midst of engineering rumblings of great moment concerned with plans for a new crossing of the bay to supplement the present crowded bridge.

Inevitably, notes were made of all these vacation interruptions, and since they are of no possible use in a notebook, they are here transcribed in the hope that they constitute news.

Colorado-Big Thompson Project—Retarded by the war, this $90,000,000 irrigation and power job (*ENR* Jan 5, 1939, vol. p. 17) is working up to full steam again. About a third of the needed money has been appropriated. To show for it, the 13.1 mile tunnel under the Continental Divide has been completed as has Shadow Mountain Dam, a 44-ft. earth and rockfill that enlarges Grand Lake by some 1,350 acres so that it can serve as the West Slope supply reservoir for the tunnel. Also complete are various electric transmission lines, camps and other construction facilities as well as Green Mountain Dam on the West Slope, the latter not an integral part of the trans-Divide project, but built in connection with it to protect water users in the Colorado River basin from shortages.

Now under construction are the tunnels and conduit that will carry the water from the east portal of the Continental Divide Tunnel to the Big Thompson River, known as the Estes Aqueduct and Power System; the Horsetooth reservoir on the plains west of Ft. Collins to be formed by a number of earthfill dams totaling 10 million yards in volume; and Granby Dam over on the West Slope into which Colorado River waters will be gathered to be pumped up to Grand Lake from whence they will start their journey eastward.

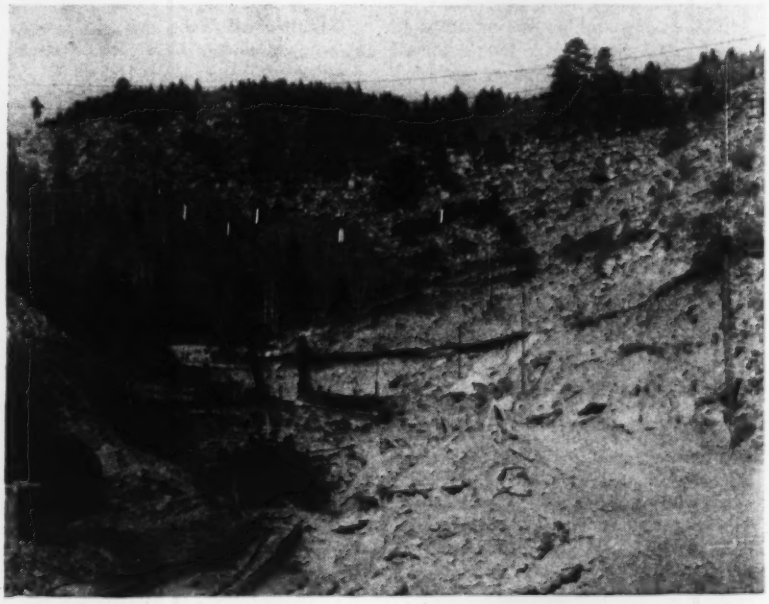
Greatest current activity is on the Estes Aqueduct and Power System. Just outside the east portal of the Continental Divide Tunnel, S. S. Magoffin Inc., which built the eastern half of the tunnel, is building a concrete corewall for the Wind River Dam, which will form a small equalizing reservoir to receive the tunnel discharge.

Beyond Wind River Dam the water will be conveyed in conduit and tunnel for about 5 miles to the 68,000-hp. hydro plant at Estes Park on the Big Thompson River. Some 12,300 ft. of tunnel is under contract to Lowdermilk Brothers of Denver, passing under Ram-Head Mt. and Prospect Mt., whose configuration causes it to be known locally as "Teddy's Teeth" after the early Roosevelt's famous incisors.

The tunnel contract is making progress despite shortages of reinforcing steel and frequent "quickie" strikes. Somewhat similar troubles, in the form of lumber shortages, beset C. H. Howell, Colorado Big Thompson project engineer for the Bureau of Reclamation, in his efforts to build construction camp buildings, but he is nevertheless looking forward to gradually increasing tempo of operations from Granby reservoir on the west to Horsetooth reservoir on the east.

In the meantime, designs for the Estes Park power plant contemplate a structure of considerable architectural appeal, and Estes Park Lake, into which the plant will discharge, is planned to be large enough so that the necessary drawdown will cause only a 3-ft. variation in surface level so that this facility can be an asset and not an eyesore.

New Mexico Water Shortage—Santa Fe, whose water is supplied by the New Mexico Power Co., had a real scare early in July when its reservoirs all but dried up. Water was rationed by confining its use to certain hours of



East portal of the Colorado-Big Thompson tunnel under the Continental Divide as it looked in July. It will carry water for use on Colorado's eastern plains.

the day, with prospects of hauling supplies in by tank car, when long-overdue rains occurred. The lesson was severe enough, however, that the company has let a contract to raise its Granite Mountain Dam on Santa Fe Creek by 31 ft. to increase its storage reserve.

The state government, also gravely concerned by the plight of its capital city, drew up plans for an extensive water resources survey of the area but postponed action when it learned, apparently to its surprise, that the Army Engineers were already conducting a similar survey, presumably with reference to nearby Los Alamos. In any event, more water than can be supplied by present mountain sources is being planned for the atom bomb town, and truck loads of pipe are daily hauled from Santa Fe to a site on the west bank of the Rio Grande below Espanola from whence it is rumored water will be diverted into an 8½-mile supply line.

San Francisco's Water Supply—While waiting for the hearings on a second Bay crossing for the growing traffic between San Francisco and the East Bay Cities (the notes on which were published in *ENR* Aug. 29, 1946, vol. p. 274) the visiting editor sought calmer surroundings by a trip to Hetch Hetchy, San Francisco's source of water supply and electric power in Yosemite National Park 175 miles away.

A motor boat trip up the 9-mile, 350,000-acre-ft. Hetch Hetchy reservoir affords ready proof of San Francisco's claim to one of the most sanitary, permanent and beautiful water supply sources in the world. Taking drainage from the High Sierra, the reservoir is practically contamination proof. The glacier-smoothed mountains contribute so little sediment that Jim Gray, the city's resident superintendent, on a recent busman's holiday, told the operators at Boulder Dam, with complete certainty, that Hetch Hetchy would be doing business with undiminished efficiency long after Lake Mead was merely a geological curiosity. As a matter of fact, Hetch Hetchy is an Indian term meaning "Plenty-plenty." Hetch Hetchy is aptly named.

As to beauty, few reservoirs in the world are fed by 1,500-ft. high waterfalls as is Hetch Hetchy in the spring. Few have cliffs rising 2,600 ft. above their water surface that exhibit striking patterns of color from granite intrusions into the country rock of the region. It was a grand place that N. A. Eckert, general manager and chief engineer of the San Francisco water department and A. O. Olson manager and chief engineer of Hetch Hetchy provided to wait out the start of the bridge hearing. . . *W. G. B.*

California and Nevada withdraw from interstate Colorado River basin group

States claim simple majority voting rule jeopardizes interests—Arizona charges self-interest dictated other states' action

The states of California and Nevada —minority voters when the Colorado River Committee of Fourteen last year approved the water treaty with Mexico —have withdrawn from the committee in protest against an "unofficial" majority rule which they said threatened to jeopardize their water interests.

Representatives of both states strongly condemned the current Mexican treaty, which allocates 1,500,000 acre-ft. of water a year to Mexico. They charge that committee approval of the treaty overrode the wishes of a majority of Colorado river water users.

Tendering their state's resignation late in July, California representatives pointed out that the committee originally had agreed that only unanimous action could result in a declaration of the committee's views. They listed three instances, including endorsement of the Mexican treaty, in which majority action had been taken as evidence of the will of the entire body.

"Use of the committee to override the interests of a participating state is not entirely attributable to the members," Evan T. Hewes, chairman of the California river board, explained. "Federal officers and others, not fully realizing the nature of the committee, assume that a majority action governs. It has become apparent that California representatives can no longer participate as members of the committee without jeopardizing California interests."

The committee was made up of two representatives from each of the seven Colorado river basin states—the other five being Arizona, Colorado, New Mexico, Utah and Wyoming. It was formed in 1938 to facilitate interchange of information and aid the states in protecting their respective interests.

California withdrew from the group on the eve of a meeting at Salt Lake City to study a Bureau of Reclamation report listing 134 potential projects for utilization of Colorado River water—most of them in Arizona. The Nevada action was taken by the Colorado River Commission of that state at a recent meeting at Las Vegas.

Run-off consistently low

California also is concerned over the fact that in nearly every year since the start of construction on Boulder Dam, the actual run-off of the river has been below the estimated 17,700,000 acre-ft. It does not support the view held in Arizona that the flow of the Gila River should not be included when computing the flow to be derived from the Colorado basin. The Gila empties into the Colorado just above the Mexican border. California claims that it should be considered as a part of Arizona's Colorado river allotment, pointing out that most of the Mexican share would come from that river if it were not diverted for Arizona use.

The biggest project on the Bureau of Reclamation's 134-item list is a $1,310,625,000 Bridge Canyon project, planned for Arizona (*ENR* July 4, vol. p. 6). Arizona supports its claim for additional water supplies by pointing to severe droughts it has suffered recently (*ENR* July 4, vol. p. 10).

These discussions over the Colorado water use have been resolved into an interstate battle, according to Governor Sidney Osborn, of Arizona. "It's probably just as well," the Governor said. "Those fellows have the idea that if they can't have their own way they don't want to play. They want all of the water in the river regardless of other people's rights."

U. S. Senator E. W. McFarland of Arizona added a further warning to California in a statement urging that state to "stop quibbling" and cooperate with Arizona for river development. He said Arizona would be "compelled" to oppose development in California, if California continued to oppose the Arizona work.

Approve Toketee Falls development for Oregon

The California Oregon Power Co., of Medford, Ore., has received a federal power commission license to proceed with its power project at Toketee Falls, on the North Umpqua River 80 mi. east of Roseburg, Ore.

The undertaking will be the first part of a six unit program that also calls for construction of a transmission line to the company's substation at Dixonville, near Roseburg. The total cost of the project is estimated at $3,200,000.

The development program calls for construction of a generating plant of 25,000 kw. capacity, powered by the stream, which drops 100 ft. per mile for a distance of 4 mi. above the falls.

ENGINEERING SCHOOL NEWS

John B. Wilbur is new head of the department of civil and sanitary engineering MIT—Dean Grinter of Illinois Tech resigns

John B. Wilbur, professor of structural engineering at Massachusetts Institute of Technology, and since June, 1944, acting head has been appointed head of the department of civil and sanitary engineering.

J. B. Wilbur

A native of Oakland, Me., Professor Wilbur was educated at Academy High School, Erie, Pa., and was graduated from M.I.T. in 1926. He received his master's degree, 1928, and a doctor of science degree, 1933. He became assistant in his department in 1926 and in 1928 joined the engineering staff of the Maine Central Railroad. He was subsequently a bridge designer for the New York Central Railroad and in 1930 returned to the institute as instructor in civil engineering. Appointed associate professor in 1934, he became professor of structural engineering in 1943.

Professor Wilbur has been active in his profession, having been associated with the design of bridges over the Cape Cod Canal and for the Lake Champlain bridge. He was chief engineer for the Smith-Putnam Wind Turbine Project in Vermont for the S. Morgan Smith Co. from 1940 to 1945. During the war he was consultant to the National Defense Research Committee. He had an important part in the development of the structural analysis laboratory at the institute, and developed the simultaneous calculator. A member of many professional and educational societies, Professor Wilbur has contributed many technical papers and is joint author with Prof. W. M. Fife of "Theory of Statically Indeterminate Structures."

Linton E. Grinter, dean of the graduate school at the Illinois Institute of Technology, has resigned to become research professor of civil engineering mechanics. He will also represent Illinois Tech at the International Mechanics Congress in Paris this fall. Dr. Grinter has been dean of the graduate school since 1937. He is widely known for his work in structural engineering.

The new dean is William A. Lewis, Jr., formerly research professor of electrical engineering and consultant to Illinois Tech's Armour Research Foundation. He went to Illinois Tech in April, 1944, from his previous position as director of the school of electrical engineering at Cornell University. He is a recognized authority in his field.

Previous to his appointment at Cornell in 1939, Dr. Lewis had served for ten years as central station engineer with the Westinghouse Electric Corporation in East Pittsburgh, Pa. At Illinois Tech he has been in charge of the $90,000 A-C Network Calculator which was installed cooperatively by a number of utility companies a year ago.

Horatio M. Fitch, a civil engineering graduate of the University of Illinois and formerly an instructor in general engineering drawing from 1929 to 1933 in that institution, has been appointed an assistant professor of theoretical and applied mechanics at the university. He took his bachelor's degree from Illinois in 1923, his master of science degree in 1933 and his degree of civil engineer in 1934. He was with the Chicago Union Station Company from 1923 to 1927 during construction of its terminal. From 1927 to 1929, he was associate editor of "Rock Products Magazine", and in 1929 served as an assistant civil engineer with the Rock Island Railroad.

Turn down San Francisco underground parking bid

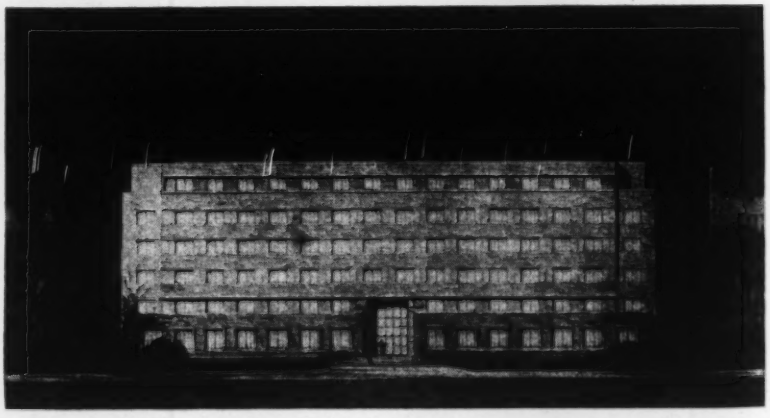
The San Francisco City Park Commission has turned down the only bid submitted for an underground garage at St. Mary's Park (*ENR* July 25, vol. p. 91). The bid listed no specific cost estimates and contained various qualifying clauses which the commissioners said were unacceptable. The project will not be readvertised until early in 1947.

The bid was submitted by the St. Mary's Garage Corp.—an organization composed largely of men who supported construction of the city's present Union Square underground parking area.

As submitted, the proposal was for a 35-year lease at $1,000 annually for a 630-car garage. All profits over $25,000 a year would apply to the lease principal. The garage title would have reverted to the city upon amortization of costs, as is the case in the agreement on the Union Square garage.

Carlton H. Wall, who headed the group of bidders, estimated unofficially that the project would cost $1,100,000, but the formal bid said "To set a fixed figure now would be so hazardous as to threaten the financial stability of the project."

Kansas—A large group of industrial and warehouse buildings will be built on a 52-acre tract in the Kaw Valley district of Kansas City, Kan., by Safeway Stores, Inc. The buildings will be for produce and grocery warehousing and food processing.



***New University Headquarters**—Contract for a $920,000 administration building—first step in the University of Chicago's building plans—has been let to the W. J. Lynch Co., and construction is expected to start soon. A conservative, modern structure, faced in limestone to harmonize with other school buildings, the structure will be six stories high, containing 1,001,600 cu. ft. of space, housing offices for the chancellor, board of trustees, and other officers. Holabird and Root are architects for the structure.*

Inter-agency body sets 1946 building at $15 billion—Sees $19 billion in '47

Five-agency committee estimates total new work for 1946 at $10 billion, repair and maintenance at $5 billion

Basing its estimates on the assumption, among others, that the Veterans Emergency Housing program will carry through as scheduled, the five-agency Inter-Agency Technical Committee for Construction Estimates last week placed total 1946 construction value at $15,052,000,000.

The group also estimated that activity in 1947 would total $19,250,000,000.

The inter-agency group is composed of representatives of the Civilian Production Administration, Department of Labor, Department of Commerce, Federal Works Agency and the National Housing Agency. It prepares estimates on construction activity at about four-month intervals for the information of the governmental construction agencies concerned.

The figure given for 1946 construction runs lower than a recent estimate made public (*ENR* July 18, vol. p. 69) by John R. Steelman, director of the Office of War Mobilization and Reconversion. Mr. Steelman estimated that 1946 work would total about $17,000,000,000.

In presenting its figures for the two years, the committee prefaced its statement with the explanation that the figures are based on "estimated value put-in-place" during January-May, 1946, and for the period June 1946-December 1947, they represent "not forecasts of construction activity, but rather a statistical measure of the dollar volumes of construction which would be put in place, . . . under existing programs, were materials and labor available."

"The figures do not purport to be forecasts, and should not be used as such," the committee added.

Among assumptions on which the report is based are: That the revised Veterans Housing Program proceed as scheduled after June 1, 1946; that authorizations under VHP-1 will continue through 1947, at a monthly rate of about $220,000,000; that federal construction will be limited, and that other new construction will proceed in accordance with current trends. The estimates attempt, however, to allow for difficulties in current construction operations.

Going into the current year's activities, the report places total new construction of all types at $10,702,000,000—this figure including $1,664,000,000 in public construction; $4,039,000,000 for all residential work; $659,000,000 for highways; $177,000,000 for military and naval work; and $809,000,000 for public utility work. Maintenance and repair work for the year was estimated at $5,150,000,000—including $700,000,000 for work on highways, and $1,300,000,000 for residential work, excluding farms.

For 1947, value of total new construction was estimated at $13,181,000,000—including $7,124,000,000 for all residential work; $2,420,000,000 for public construction, and $1,000,000,000 for highways. Maintenance and repair work for that year is placed at $6,075,000,000.

Denver sewage plant again under attack

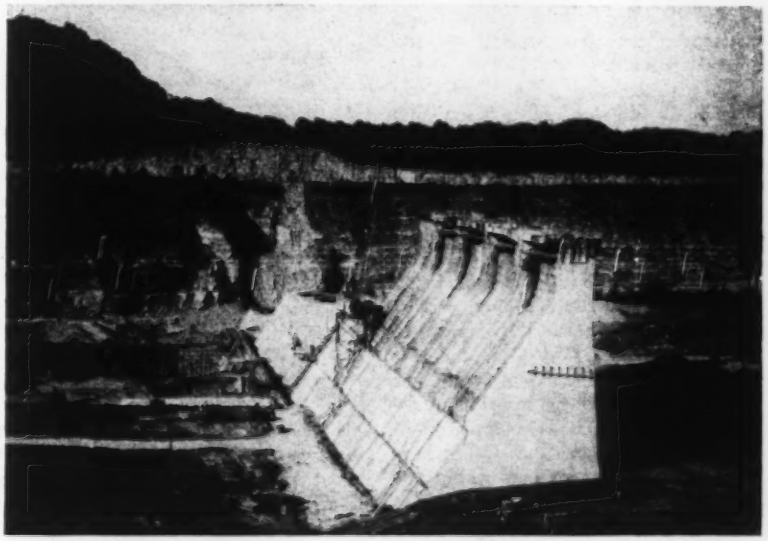
In a renewal of a recent state-city controversy over operation of Denver's sewage treatment plant, Colorado State Board of Health officials last week charged that the plant's 50-mgd. discharge to the South Platte River does not meet state sanitation standards and that additional treatment is needed. The attack is the second within a year (*ENR* Nov. 22, 1945, vol. p. 690), the first having been dropped (*ENR* Jan. 3, 1946, vol. p. 3) until the state board could make further studies of industrial pollution.

Main point of contention in the matter is the city's refusal to utilize the plant, originally designed for complete treatment, for more than primary treatment. This is considered by the state authorities to be inadequate, especially where the effluent is used to irrigate vegetable crops. An additional factor now entering the picture is said to be the current state-wide infantile paralysis epidemic.

Name new deputy chief for Kentucky highways

E. E. Pfanstiel, of Carlisle, formerly assistant purchasing agent for the Kentucky State Highway Department, has been named deputy highway commissioner.

A former superintendent of Carlisle City schools, Mr. Pfanstiel is a graduate of Pennsylvania College, and holds a degree in business administration from the University of Kentucky. During the first World War he served with the Corps of Engineers.



***Work Goes On**—Contractors' crews continue concrete-pouring operations on Center Hill Dam, on the Caney Fork River 14 miles east of Carthage, Tenn. The $25,000,000 project—being built under supervision of the Corps of Engineers—was started early in 1942, when first contracts were let to a group of Kansas City, Mo., firms. Maximum height of the dam will be about 250 ft., with a 1,382-ft. concrete section, and 790 ft. of earth embankment (see ENR August 6, 1942, vol. p. 193).*

Other building trades unions break strike of Cleveland, Ohio, carpenters

Unusual retaliatory strike forces carpenters to return to general projects—climaxes bitter labor squabble

In an action almost without precedent in labor annals, union building craftsmen in Cleveland, Ohio, last week broke a strike of union carpenters by a retaliatory strike that tied up all building construction in the area for a day.

The action of the building craftsmen climaxed a long-standing feud between them and the carpenters.

In protest against a 2½ cents per hour reduction in pay rates, ordered by the Wage Adjustment Board in a recent decision, all union carpenters in the Greater Cleveland area were called from their jobs Aug. 26 and reassigned to veterans' housing projects. By this action, the Carpenters' District Council brought to a halt construction work on a number of "promotional ventures" such as movies, restaurants and night clubs, and on a number of major projects including factory additions for the Fruehauf Trailer Co. at Avon; a Sears Roebuck Co. store addition and other work.

Counter-strike called

In retaliation—and not in support—of the carpenters' action, 24,000 members of 18 other building trades unions announced they were walking off their jobs August 29.

The results were immediate. On August 30 Morris A. Hutcheson, first general vice-president of the International Carpenters Unions telephoned Cleveland council officials to order them to call off the strike, and permit their men to work "wherever and for whomever" they pleased.

The local organizations complied, and carpenters and other building workers were returning to work by noon of August 30.

The opposing unions had made their retaliation effective by refusing to deliver materials even to veterans' housing projects—a move that would have shut down even these jobs within two days, officials estimated.

Background of strike

A wage increase of 25 cents per hour was gained by the carpenters following a 35-day strike which ended early in July. At the same time, the carpenters won the right to assign union members to whatever jobs union officials agreed upon.

With the increase of carpenters' pay to $1.90 per hour, members of the local builders' associations reopened negotiations with other craftsmen, who had previously agreed to a 12½-cent per hour increase, and then the entire wage structure was submitted to the Wage Adjustment Board for ratification.

In its decision, WAB approved the additional raise for "top-craft" workmen, but clipped 2½ cents per hour from the carpenter's wage rate.

Bad plumbing blamed in N. Y. typhoid outbreak

Defective plumbing, which permitted sewage to overflow and seep from a second-floor apartment to a ground floor refrigerator in a vegetable store was the cause of a minor typhoid epidemic in New York City that has affected 19 persons thus far. This conclusion was reached by investigators of the city's health department who last week traced the disease outbreak to the house of one of the 500 registered typhoid carriers in New York.

Cases of typhoid fever, which were first reported on Aug. 15, were confined to a five square block area in the Washington Heights section. Ten known typhoid carriers (persons who are immune to the disease but harbor the germ) were recorded as living in the area. Health department inspectors then made a careful investigation of these homes until they discovered an apartment house in which a second floor sewer had backed up on July 7. The carrier, a woman of 76, occupied rooms on the fifth floor.

Syracuse, N. Y., considers $5 million sewage plant

Plans for a new sewage treatment plant at Syracuse, (New York,) to cost about $5,000,000 are being studied by Charles E. Billion, commissioner of public works.

A whole new system would be needed in the event the city was prohibited from continuing its present sludge disposal arrangement.

At present, the city has one of the cheapest sewage plants in the country, since it pumps its sludge into the waste beds of a large industrial plant for neutralization without cost.

Union-sponsored housing project at South Bend

What is said to be one of the largest housing projects promoted by a labor union is scheduled to get under way at South Bend, Ind., soon with 650 brick houses to be built on a tract of 155 acres at the northeast edge of the city. The total cost of the houses will be about $4,000,000.

The project is a co-operative venture sponsored by the employees of Local 5 U.A.W.-C.I.O. of the Studebaker plant.

Veterans will be given first chance at the new residences. Schools are already located near the tract, altho high school pupils will have to take a bus to school.

Eight types of homes will be constructed on the tract.

Open 250 ft. high bridge over Kentucky River

The new 1,736-ft-long Clay's Ferry bridge over the Kentucky River on U. S. 25 at Cleveland, south of Lexington, Ky., was officially opened to traffic Aug. 17.

This bridge is said to be one of the highest continuous steel deck structure in the country. It is 250 feet above water level, making it the highest highway bridge east of the Mississippi River and one of the seven highest in the United States.

It replaces a narrow, wrought iron truss span built in 1869 as a privately-owned toll structure. The old bridge was flanked by steep, winding hair-pin curve approaches on 8 percent grades, now eliminated by the direct, high-level bridge and straight smooth approaches. The use of the new bridge will shorten the distance between Lexington and Richmond, Ky., by one and a third miles.

Correction

In an article in *ENR* August 15, vol. p. 208, the name of the new president of the Chicago subsidiary of James Stewart and Co. was erroneously given as Henry G. Olmstead. The correct name should have been Henry G. Onstad.

In the issue of Aug. 22, vol. p. 216, it was stated that the Tennessee Valley Authority would build a $3,000,000 phosphate fertilizer plant at Mobile, Ala. During the recent Congressional session, a Senate-House disagreement resulted in dropping the appropriation for this work.

OBITUARY

Albert Sears Crane, 78, New York hydraulic engineer died Aug. 25 at Bar Harbor, Me. Mr. Crane retired ten years ago as vice-president of the J. G. White Engineering Corp., New York. He was a specialist in design and construction of large earthwork dams. While serving as consulting hydraulic engineer for White, he negotiated a contract and plotted the designs for ten irrigation projects in Mexico in cooperation with the Mexican government.

Mr. Crane was a graduate of Cornell University. He served as assistant engineer of Newton, Mass., from 1891 to 1895, and assistant engineer of the Department of Sewers in Brooklyn from 1895 to 1898. In 1905 he joined the White firm.

Henry Harrison Kester, 61, civil engineer and contractor, who worked in Southern states for many years, died at Van Buren, Ind., Aug. 18.

Henry DeHuff, 72, engineer, died Aug. 22, at Cynwyd, Pa. He was a graduate of Lehigh University, 1895. From 1898 to 1917 he was chief engineer for the D'Olier Engineering Co. at Philadelphia, Pa.

E. Vernon Wills, 44, formerly associated with his father in the general construction business at St. Louis, Mo., and for several years an engineer or superintendent with Stier Bros. and G. L. Tarlton, contractor, St. Louis, and the Cities Service Refining Co., Lake Charles, La., died Aug. 15. Laterly he was supervisor of construction for Ed Niles, general contractor, of Houston, Tex., and was engaged in supervising the construction of a sewage treatment plant for the town of Goose Creek, Tex.

Garnet John Lamb, 58, construction engineer, died at Sault Ste Marie, Ont., Aug. 24. He was at one time district engineer for the Ontario Department of Highways but since 1935 was associated with the Dominion Department of Transport, on airport construction in eastern Ontario.

Stanley Lawson Roush, 61, bridge designer and formerly city and county architect in Pittsburgh, Pa., died Aug. 23. After graduation from Carnegie Institute of Technology, Mr. Roush served as city and county architect. He had designed numerous bridges, schools and industrial buildings.

Louis C. Lawton, 78, city engineer of Haverhill, Mass., 1912 to 1938, died Aug. 27. A graduate of Yale University, Mr. Lawton had been field engineer for Berlin Iron Bridge Co., Berlin, Conn., engineer on grade crossing for the Boston and Maine Railroad for 15 years, and more recently chairman of the Merrimack Valley Sewerage Committee.

L. R. Young, 48, vice-president and general manager of Internation Engineering Co., Inc., of Denver, Colo., died there Aug. 24. Mr. Young, a graduate of Clarkson School of Technology, was engaged throughout his professional life on the design and construction of power and flood control developments, with New York Power Corp., U. S. Engineers, Morrison-Knudsen Co., Inc., and others.

Harry Lincoln Neel, 57, city engineer of Santa Maria, Calif., from 1916 to 1932 and county engineer for the 5th supervisoral district of Santa Barbara County since then, died Aug. 22.

Calendar of Meetings

NATIONAL

American Public Works Association, annual Congress, Texas Hotel, Fort Worth, Texas, Sept. 22-25.

The Producers' Council, Inc., fall meeting, Hotel Pennsylvania, New York, N. Y., Sept. 25-26.

Highway Transportation Congress, Hotel Mayflower, Washington, D. C., Sept. 26-27.

Building Officials Conference of America, annual convention, Peabody Hotel, Memphis, Tenn., Sept. 30-Oct. 3.

REGIONAL

American Water Works Association, Southeastern Section. DeSoto Hotel, Savannah, Ga., Sept. 9-11.

American Water Works Association, Western Pennsylvania Section. Roosevelt Hotel, Pittsburgh, Pa., Sept. 12-13.

American Water Works Association, Rocky Mountain Section. La Fonda Hotel, Santa Fe, N. M., Sept. 12-13.

Georgia Water and Sewage Association, annual meeting, in conjunction with 15th annual Georgia Water and Sewage School. Georgia Institute of Technology, Atlanta, Ga., Sept. 16-18.

New England Water Works Association, 65th annual conference. Poland Spring House, Poland Spring, Maine, Sept. 16-20.

American Water Works Association. Michigan Section, Park Place Totel, Traverse City, Mich., Sept. 18-20.

American Water Works Association. Four-States Section, Brunswick Hotel, Lancaster, Pa., Sept. 27-28.

American Water Works Association. New York Section, DeWitt Clinton Hotel, Albany, N. Y., Oct. 3-4.

American Water Works Association. Ohio Section, Fort Hayes and Chittenden Hotels, Columbus, Ohio, Oct. 10-12.

CONSTRUCTION ACTIVITY

As Reported this week to . . .
Engineering News-Record

CONTRACT VOLUME

Continental U. S. Only (Thousands of Dollars)

	Week of September 5 1946	Cumulative 1946 (36 wk.)	Cumulative 1945 (36 wk.)
Federal	$2,714	$517,463	$654,423
State & Mun.	24,919	965,702	225,251
Total Public.	$27,633	$1,483,165	$879,674
Total Private	58,432	2,313,005	412,186
U. S. Total..	**$86,065**	**$3,796,170**	**$1,291,860**

WHERE CONSTRUCTION ACTIVITY ORIGINATED THIS WEEK

Dollar Volume (Thousands)

Type of Work	This Week	Cumulative 1946 (36 wk.)	Cumulative 1945 (36 wk.)
Waterworks	$803	$70,169	$36,445
Sewerage	970	68,700	21,743
Bridges	2,348	95,983	22,387
Highways 15,976		558,578	150,135
Earthwork, Waterways	759	290,896	34,720
Buildings, Public 6,826		274,629	402,994
Industrial 17,495		711,012	273,293
Commercial ..23,261		1,454,640	85,875
Unclassified 17,627		271,563	264,268

NOTE: Minimum size projects included are: Waterworks and waterway projects, $22,500; other public works, $40,000; industrial buildings, $55,000; other buildings, $205,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1946 (36 wk.)	Cumulative 1945 (36 wk.)
NON-FEDERAL	.....	$558,784
Corporate Securities	Current	117,582
State and Municipal	figures	277,602
RFC Loans	not	24,600
REA Loans	available	60,000
Fed. Aid Highway	.....	79,000
FEDERAL	.....	1,049,898
Total Capital	.....	$1,608,682

ENR INDEX NUMBERS

Index Base = 100		1913	1926
Construction Cost..	Sept. '46	360.19	173.14
Building Cost.....	Sept. '46	272.04	147.06
Volume	August '46	258	113

EDITORIALS

VOLUME 137 NUMBER 10

September 5, 1946

Public Works to the Fore

THIS IS THE TIME of year when engineers in public works departments put away their fishing tackle and begin to give serious consideration to some of the problems that lie before them. To that end, the American Public Works Congress soon will be held in Fort Worth and the New England Water Works Association will meet at Poland Springs. Similarly, a major part of this issue has been given over to matters of special interest to men on public work and to new developments in the field. In these articles will be found a host of suggestions on operating techniques and current practice in public works developments.

Turbo-Generator Foundations

EMPIRICISM has not been eliminated from some phases of structural engineering. In the design and construction of turbo-generator foundations, which are the essential elements of steam power stations, reliance still must be placed mainly on past experience and judgment because of the complex problems involved in minimizing vibration. As pointed out elsewhere in this issue, components of a foundation are proportioned, in general, by rule of thumb. During construction, extreme care must be exercised. Violations of even minor rules of good construction practice may produce undesirable results. Structural engineers concerned with this work will find the advice of engineers of the equipment manufacturers helpful.

Highway Field Engineers

THERE are two noticeable trends in the attitude of ex-service men returning to the field of highway construction that state highway departments would do well to recognize in the interest of increasing their engineering forces. One is the tendency to avoid a desk job in favor of taking an active part in construction, and the other is the desire to settle down and establish a home. Already, the postwar reaction to a desk job is beginning to show up in the increasing number of men seeking work in the field. This unbalance in the supply of field and office men can be met in some instances by establishing a working routine that combines both field and office duties. But all field work cannot be handled in this way, and much of it, in many parts of the country, still must be done at points where housing is scarce or nonexistent. Living in camps at these isolated spots holds no romance for men just out of military service. These men want to live under homelike conditions. To meet this situation, greater care should be exercised in the advance selection of field headquarters where housing is available, and increased latitude should be given the field engineer to enable him to keep in contact with his home.

A Sound Decision

DENIAL by the Civilian Production Administration of the request of the Civil Works Division of the U. S. Engineers for MM priority assistance to obtain construction supplies for rivers and harbors and flood-control projects (*ENR* July 25, 1946, vol. p. 90) must be regarded as in the public interest, if there is real sincerity in the desire to build housing for veterans. And if the decision were sound when it was made a month ago, it is even more proper after last week's order requiring that 75 percent of all priority materials be set aside for veterans' housing. To provide the War Department a priority rating on the remaining 25 percent of materials would have given it a disproportionate advantage over other governmental agencies and private builders.

Regional Airport Development

COMMERCIAL AVIATION is growing so rapidly as to indicate the need for regional rather than local development of ground facilities in all populous areas. A report on future air traffic just made to the city of New York by the engineering firm of Madigan-Hyland estimates that in the next ten years the total movement of both commercial and private planes in and out of the New York metropolitan district will have increased from 197,060 in 1946 to 974,500 in 1955. Similar conclusions were reached by the Port of New York Authority in a study of the need for enlargement of the airfield at Newark, N. J. Such a load will tax the capacity of the enlarged Newark field, La Guardia field and New York's new Idlewild field. It means that before 1955 the New York region must have other fields, possibly separate field for private planes and non-scheduled commercial operators. And if the added facilities are to serve the metropolitan district most efficiently, they must be planned on the basis of meeting the needs of the

whole area, not just one part of it. The same can be said of the San Francisco Bay region. State lines or municipal boundaries should not be permitted to check regional planning for air-transport facilities.

A Confused Situation

GOVERNMENT EMPLOYEES have no right to strike, but they continue to strike and attain their objective primarily because of public apathy toward the fundamental question of providing such employees with collective bargaining facilities that will make resort to strikes unnecessary. That is the main conclusion to be drawn from Charles S. Rhyne's thoughtful discussion of "Public Workers and the Right to Strike" in this issue.

In prohibition days this country learned that it takes more than a law on the statute books to eradicate an evil. The law must be equitable and it must have wholehearted public support. Similarly, it is not enough to state that it is fundamental to our form of government that the government's employees cannot strike, because that restriction deprives them of a right possessed by every other citizen. Also, it puts government employees in a position where they can be exploited by indifferent government officials. If public support is to be gained for drastic action against government employees who resort to strike, these employees must first be supplied with collective-bargaining rights of so high an order that they cannot be ignored or set aside by callous, elected officials. Lack of such rights is the basic cause of the present confused situation.

Once this condition is recognized, the prospect for harmony in municipal labor relations will not be as dark as it would appear from a casual reading of Mr. Rhyne's discussion. He points to some of the current causes of unrest among municipal employees, one of which is the widespread opinion that government employees not only have no right to strike but that they also lack the right to bargain collectively. A first step toward solution, therefore, would be general recognition of the right of government employees to organize and bargain collectively. The second step, and the most difficult one, will be the development of adequate procedures for such bargaining. That is a problem calling for the best thinking of government officials familiar with the issues involved, lawyers who specialize in labor matters, and union leaders who have the courage to concede that the right of the public to a continuation of essential service is superior to the right to strike.

New Housing Horizon

BEYOND THE PRESENT welter of emergency measures to create some immediate housing relief, and the confusion and disappointments that have resulted, the long-term prospects for substantial and lasting progress in housing are better than is generally realized. The reason for this rests largely with the entrance into the house building and ownership field of a new and powerful factor in the form of institutional investors such as insurance companies and savings banks. They have provided a new horizon for housing progress.

Starting in New York as a result of the enactment in 1943 by the state legislature of an "urban redevelopment companies" law, permitting and encouraging investment of institutional money in housing, the results have been felt all over the country, since many of the institutions are nation-wide in scope. In California, too, a Community Redevelopment Act was enacted in 1945 to aid both private and public enterprise in clearing blighted areas for rebuilding. The steps that these two states have taken are worthy of wide emulation, and all architects, engineers and city planners should help in that undertaking.

Over and above the significant increase in our housing plant, the entrance of institutional investors into the house ownership field should tend to improve the character and durability of construction. When such investors merely supplied money for a first mortgage they were not too concerned with the soundness of design and construction beyond mere protection of their loan until it was paid off. Now they have much more at stake.

The urban redevelopment laws also mark a welcome if tardy recognition of the need for encouraging private as contrasted to public tax-money investment in low and medium priced housing. And they offer a practical method of clearing blighted city areas. On many scores, the housing horizon is bright and promising.

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Public Workers and the Right to Strike

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***Editor's Note**—An analysis of strikes by public employees and the experience of cities with municipal employee unions was recently published by Mr. Rhyne under the title "Labor Unions and Municipal Employee Law." This study reveals some basic conclusions that must be considered in evaluating the future outlook in this field. In the following article Mr. Rhyne briefly summarizes these conclusions after discussing the basic principles involved and some experiences with municipal employee strikes.*

"THERE IS NO RIGHT to strike against the public safety by anybody, anywhere, at any time." Thus spoke Calvin Coolidge, when, as Governor of Massachusetts, he condemned the Boston police strike of 1919. The Boston police had struck in protest against an order prohibiting them from joining a labor union. While that strike was in progress Boston saw looting of stores, violence, injury to many persons, and four deaths. As a result 1,100 strikers were fired as "deserters" and a new police force was recruited. President Woodrow Wilson termed the strike "an intolerable crime against civilization."

This strike and his handling of it brought Calvin Coolidge national fame and ultimately the presidency of the United States. It is the earliest instance in this country where national attention was focused on a strike by public employees. But both before and after the Boston strike there have been other strikes of public employees. An examination of the problems involved in such strikes is in order.

In searching for basic principles governing the right of public workers to strike, one finds several statements of public officials like those quoted above, and also statements by the courts. All of them are most helpful. Some of the more noteworthy statements bearing on the problem are given in the accompanying panel.

These, however, are only a few of the many that are available. Other state attorneys general have rendered opinions holding that strikes by public employees are illegal and many city attorneys have announced similar decisions.

Court decisions follow the same pattern. For example, in February of this year a Texas court issued an order restraining members of a union of city employees "from striking or engaging in a strike against the City of Houston." On Aug. 15, an Oklahoma court reaffirmed an order of like character involving striking city employees of Tulsa. Injunctions prohibiting picketing that interferes with the carrying out of city functions were also signed by these courts.

Strikers subject to discharge

Having compiled all these statements on the illegality of strikes by public employees, there remains to be considered the legal effect of such a strike on the striking employee, because such strikes have occurred in the past and will undoubtedly occur in the future.

If the striking public employees are under civil service they are subject to dismissal under civil service rules. These rules are fairly uniform throughout the nation, providing usually that "any employee who absents himself from duty for a period of two consecutive days without a specific grant of leave of absence from the hiring authority or director may be deemed to have resigned from the civil service and vacated his position."

Under a similar civil service rule, dismissal of certain public works employees of the city of Newark who had engaged in a strike was upheld by the New Jersey Civil Service Commission with a statement that "public employees have their rights as do other citizens, but in the very nature of their employment they must forego some of the practices which private employees may exercise . . ."

On the question of discharge of striking employees, there seems to be no doubt that where civil service systems exist such discharges are provided for by the law and the civil service rules just referred to. This has been pointed out by opinions of state attorneys general and city attorneys in numerous instances. Where the employees are not serving under civil service or a merit system, the city can, of course, discharge them without cause, and there could be no legal redress if they were discharged for engaging in a strike.

Federal laws provide penalties

The National Labor Relations Act, the so-called "Wagner Act", and other federal labor legislation specifically provide that such legislation is not applicable to federal, state and city employees. Also, there is federal legislation prohibiting strikes by members of the fire and police departments of the District of Columbia with penalties of discharge, fine and imprisonment for violation. In addition, federal department and agency appropriation acts now contain a rider providing that "any person who is a member of an organization of government employees that asserts the right to strike against the government of the United States, or who advocates, or who is a member of an organization that advocates, the overthrow of the government of the United States by force or violence and accepts employment the salary or wages for which are paid from any appropriation contained in this act shall be guilty of a felony and, upon conviction, shall be fined not more

than $1,000 or imprisoned for not more than one year, or both."

On the state level, the only legislation is a statute recently adopted by Virginia prohibiting re-employment for a period of one year by any public agency of the state or of any city or county of any employee who participates in a strike against his government employer. It is interesting to note that in England the Conspiracy and Protection of Property Act and the Electricity Supply Act prohibit strikes among gas, electricity or water utility employees where such a strike would deprive a community of these services. Yet 2,000 maintenance workers on Aug. 12 were striking against the Gas Light and Coke Co., of London, putting that city into partial blackout and affecting 20,000 industrial concerns. Similar legislation was proposed in the 79th Congress, but was not adopted.

The foregoing authorities clearly indicate that public employees are in a category separate and apart from those in private industry. Public officials, the courts, and legislation adopted for federal, state and local governments all emphasize this distinction between public and private employment. Governments are created and operate under statutes prescribing their powers. Private employment does not operate under such restrictive limitations.

Government functions must continue

It is fundamental that public employees by accepting public employment undertake an obligation to carry out the functions of government in a continuous, efficient and proper manner. The public safety and welfare requires a continuous operation of these functions. Police and fire protection, maintenance of health and sanitary services and regulations, maintenance of public hospitals and in fact, the maintenance of all functions of government are essential to the safety, health and welfare of any community.

If public employees fail to perform their public tasks, the effect is not just a loss of profits to a private individual or corporation, but an injury to the public at large. The Boston police strike with its violence, looting, property damage and deaths illustrates what can happen when a police force strikes. One need only use his imagination to picture the effect of a strike by fire department employees and by employees of other municipal services whose work is vitally essential to the health, safety and general welfare of the local community. If, for example, employees of the local sewer department go on strike and are not available to cope with emergency problems created by the breaking of a pipe or some similar occurrence, widespread injury through disease from escaping sewage may result.

Any public employee may, of course, quit his job at any time. But he has no right to combine and conspire with others to prevent the performance of a city's governmental functions by refusing to work, yet at the same time expect to retain the privilege of continuing in the public service. In sum, therefore, the basic principle that there is no right to strike against the government is grounded upon a sound public policy which demonstrates that labor's right of strike must give way to the paramount public interest and need for continuous functioning of all activities and services of government.

Strikes illegal but they do occur

Despite the basic principle that public employees have no right to strike, many recent disputes between city employees and city officials have culminated in strikes. For example, national attention was focused on the recent strike of municipal employees in practically all of the essential services of the city of Rochester, N. Y. The controversy between the city and the unions of its employees resulted from the abolishment of 489 jobs in the public works department of the city, in which a labor union was seeking to organize workers. A city-wide sympathy strike of union members was resorted to. Approximately 30,000 non-city-employee union members were idle during the one-day shutdown, which was ended when the unions agreed to accept the city administration's promise to permit any city employee to join any organization he pleases as long as that organization is loyal to the United States and does not claim the right to strike against the public.

In Houston, Texas, a recent 6-day strike of over 700 city employees was terminated after another city-wide sympathy strike of non-city-employee union members. In this case the mayor agreed to survey the existing wage scales of city employees in comparison with comparable work in private industry in the Houston area and to rectify any deficiencies or inequities. The striking employees were returned to their jobs with full seniority rights and unimpaired civil service rights. The city, meanwhile, had carried out its obligation to continue essential public services by use of other employees during the strike and by securing a restraining order to prevent the strikers from establishing picket lines around municipal buildings within the city lest they interfere with the city in carrying out its functions.

In Cleveland, Ohio, city hall employees recently demanded a wage increase ranging from $300 to $420 in their annual salaries. The ensuing strike of approximately 700 workers, which threatened, incidentally, to spread to all city employees, was terminated eight hours after it had started. During the strike a picket line had been placed around the city hall and only a few of the 2,000 city employees entered the building. The solution was an agreement by the city to continue discussions on wages which had been started before the walkout.

At the time of this writing, a strike of city public works department employees is in process in Portland, Maine. In addition to the striking city employees, local union leaders have organized a sympathy strike with the result that bus service is paralyzed, trucking is crippled, and building and business generally affected. The unions are demanding a 15-cents-per-hour wage increase and recognition of a city employees' union for collective bargaining purposes.

Many other cities affected

In Reno, Nevada, a recent strike of the city's garbage truck drivers and helpers resulted in the passage of an emergency resolution by the city council removing the striking men as city employees and terminating all their civil service rights. Increased pay for the new crew hired by the waste removal department will be absorbed by the forfeiture of vacation pay by the discharged workers.

In 1942, Dallas, Tex., adopted an ordinance forbidding union membership by city employees. Yet early in

1946 the CIO obtained more than 200 municipal employees as members of their local for city employees and secured a temporary restraining order prohibiting the city from discharging them. In a District Court ruling, however, the temporary injunction was set aside and the case is now on appeal. The union has indicated that an appeal will be taken to the United States Supreme Court, if necessary.

In Detroit, the acceptance of an agreement providing for a 44-hr. week, a 15-cent hourly increase in pay, and submission to arbitration of a provision for 20-min. mandatory overtime for check-in and check-out for operators resulted in a termination on April 7 of the strike of that city's street railway employees. The city council is considering action which would make strikes of city employees illegal, prohibit city officers from negotiating with such strikers and deprive strikers of their accumulated civil service and pension benefits.

Garbage collectors and incinerator workers who participated in a recent 3-day strike at Miami, Fla., were dismissed without receiving any of the benefits of the recently adopted 15 percent pay raise on the first $3,600 of annual wages. In Tulsa, Okla., garbage collectors and street workers returned to their jobs on Aug. 15, ending a 7-day strike for union recognition that for a time threatened to mushroom into a city-wide "labor holiday". A court order forbidding picketing and solicitation of walkouts caused union officials to ask the 245 strikers to return to their jobs.

In McKeesport, Pa., city workers struck in July for an 18½-cent hourly increase in salary. After several days of negotiation the city adopted an ordinance giving the strikers a raise of 8 cents per hour effective Aug. 1. Taxpayers have now filed a suit to prevent the city from paying the wage increase. It is contended that under applicable statutory provisions any change in the municipal budget after it has been adopted can be made only in cases of great emergency, and that the strike is not such an emergency as contemplated by the emergency authorization.

Early in July a threatened garbage collectors' strike in Louisville, Ky., was averted by the city's agreeing to try to find enough money to pay the workers a straight 70 cents an hour and to provide for compensation insurance. After a 4-day walkout, unionized Canton, Ohio, municipal employees, on June 14, agreed to a two-week truce to permit arbitration of their demands by a special committee set up by the city council. Among other things, the 188 workers involved were seeking a wage increase of 18½ cents an hour.

Per diem employees of the Scranton, Pa., department of public works were out on strike during May, with picket lines being maintained at the city hall and elsewhere. The strike was called on May 16 in protest against Mayor James T. Hanlon's action in laying off 160 union men. City garbage collectors in Cedar Rapids, Iowa, recently went on a 6-day strike in protest against a general pay raise to city employees which the group termed "wholly inadequate." In San Francisco, the city's municipal railway employees have made repeated threats of strike in connection with their demand for wage increases amounting to an estimated $1,400,000 a year. This would virtually wipe out reserves accumulated from the recent carfare increase and intended for the railway's rehabilitation program.

The Supreme Court of the United States recently denied a petition seeking review of a decision of the Supreme Court of Mississippi upholding dismissal of 36 police officers of Jackson, Miss., where the dismissals were based upon violation of an order prohibiting union membership.

Strikes result from low pay

This, therefore, is the record of the past few months. Almost all of these strikes are a direct result of the effort by public employees to secure wage increases to offset the current increase in prices of all commodities.

It is all too true that public employees are the lowest paid group of workmen in this country and it is only natural that they feel the current high prices more than most employee groups. Congress has recently adopted legislation and appropriated funds to alleviate this situation somewhat with respect to federal employment. But employees of state and local governments, although some have received wage increases, are still the lowest paid large group of employees in the country. The primary reason for this is that public officials in general consider it "politically unpopular" to advocate wage increases for public employees.

This matter of wage scales is a basic problem of nearly all state and local governments. Our "government by law" should be able to solve this problem of fair wage treatment for public employees before they are led to such a point of dissatisfaction that they violate their obligation as public employees and, as stated by the War Labor Board, hold "a strike gun to the head of government" to seek wage increases and improvements in conditions of employment.

Removal of causes needed

As can be seen from the foregoing, the mere fact that strikes by public employees are illegal and the very fact that they injuriously affect, or in some instances effectively paralyze, a whole community, does not prevent such strikes from occurring. There is a growing tendency to attempt a city-wide sympathy strike in aid of any small number of city employees who strike for any purpose. To use such a plan for the sole purpose of forcing city officials to make unwarranted concessions that cannot be justified on their merits is a serious injury to the public interest. In this way a small labor group can circumvent the orderly process of government and substitute its own whims and selfish desires for democratic process. The future in this field depends not so much upon basic legal principles as upon common sense administration to meet and remove in advance most of the causes of the strikes which have occurred and which are occurring.

A study of all available material on strikes by public employees and the experience of cities with unions of city employees reveals that, except with respect to policemen, firemen and school teachers, it is generally conceded that municipal employees are free to organize their own labor unions or to affiliate with any outside union. A few cities have entered into written agreements with labor unions representing city employees. Where such written agreements exist they are generally little more than statements of a municipal

STRIKERS VS. GOVERNMENT—OFFICIAL VIEWS

"A strike of public employees manifests nothing less than an intent on their part to obstruct the operations of government until their demands are satisfied. Such action, looking toward the paralysis of government by those who have sworn to support it, is unthinkable and intolerable."—**Franklin D. Roosevelt.**

"The city does not and cannot recognize the right of any group to strike against the city."—**F. H. LaGuardia, while mayor of New York City.**

"WPA workers cannot strike against the federal government because no public employee has such a right."—**Frank Murphy, now a justice of the U. S. Supreme Court, while serving at Attorney General of the U. S.**

"Strikes of governmental employees cannot be countenanced if we are to preserve government by law, administered by representatives of the people . . . it must be conceded that there is no right whatsoever in employees to strike against the government, whether it be federal, state or a political subdivision of the state."—**National War Labor Board decision holding that it had no jurisdiction over labor disputes between cities and their employees.**

". . . improper and inimical to public interest . . . The public cannot brook any interference with the activities of an institution on which it relies for the treatment of the sick and hurt . . ."—**Justice F. Pecora, of the Supreme Court of N. Y., in issuing an injunction prohibiting a strike of hospital employees.**

"A strike of public employees called for the purpose of coercing public officials into exercising discretionary powers vested in them by law in a manner satisfactory to the strikers is in reality a form of rebellion against the government."—**Attorney General of Michigan, 1941.**

"Failure of governmental employees to perform the functions of government which they have sworn to support amounts to nothing less than civil insurrection."—**City Attorney of Berkeley, Calif.**

policy of cooperation with the particular labor union.

This is because it is recognized that any agreement between a city and a labor union that grants the union undue preferences such as the closed shop, maintenance of union membership or recognition as exclusive bargaining representative, is an unlawful delegation of public power to a private organization, i.e., the union. Also, any provision which would give the union a preferred status is an illegal discrimination incompatible with the legal rules governing public employment.

In this regard, it was found that the "check-off" provision usually found in labor-union contracts is regarded as a device to accomplish a closed shop and is, therefore, an unlawful preference in favor of a union. Voluntary dues-deduction systems initiated and terminable by the individual employee's request have been looked upon as lawful, however, although some opinions indicate that even such voluntary deductions for a private organization like a labor union are contrary to public policy, and that the city should confine itself to deductions from employees' salaries for pensions and other public purposes.

Even arbitration clauses which allow submission of disputes to outside impartial persons and which bind cities to such arbitration decisions are regarded as an illegal delegation of the authority conferred by law upon city officials. All agreements which result in direct conflict with civil service or other laws applicable to cities are also regarded as illegal.

The study and conclusions referred to indicate that in the future, as in the past, this strike problem as it is relates to union membership cannot be solved, except in the case of police, firemen and school teachers, by outright prohibition of union membership by public employees. Labor unions are here to stay and membership in them by all city employees except those just named is in many jurisdictions an established right.

Getting rid of the unions is no cure for dissatisfied employees. The problem is much more complicated than that. The dissatisfaction existed, in most instances, before the unions came along.

But since unions have spearheaded recent disputes and have sponsored ideas and procedures like the "city-wide" sympathy strike, it is only natural that they have received the chief blame for all the trouble which has resulted.

Real solutions to this troublesome problem are, however, now being worked out by those city officials who, often for the first time, are seeing to it that adequate machinery is established for the purpose of amicably and satisfactorily solving municipal employee problems in the departments under their jurisdiction. To maintain efficient municipal administration requires an equally efficient and satisfied city employee. Forward-looking public officials in many cities are trying to set up this municipal personnel machinery in such a way that they will have the advantage of all the help they can get in solving the really difficult problems that exist.

Public officials restricted

In setting up adequate municipal machinery for the solution of municipal employee problems, public officials cannot for one moment lose sight of the basic legal limitations under which they must carry out their duties in this regard. As President Roosevelt stated so well, "All government employees should realize that the process of collective bargaining, as usually understood, cannot be transplanted into the public service. It has its distinct and insurmountable limitations when applied to public personnel management. The very nature and purposes of government make it impossible for administrative officials to represent fully or to bind the employer in mutual discussions with government employee organizations. The employer is the whole people, who speak by means of laws enacted by their representatives in Congress. Accordingly, administrative officials and employees alike are governed and guided, and in many instances restricted, by laws which establish policies, procedures, or rules in personnel matters."

The late Chief Justice Holmes once said, "To rest upon a formula is a slumber that, prolonged, means death." The conceded principle or formula that "public employees have no right to strike" is no solution to the personnel problems of government; neither is it an invitation to do nothing to improve personnel conditions of public employees. It is, rather, a challenge to public officials who have employees under their direction to make public employment conditions so good that public employees will not even think of violating their public obligations by going out on strike.

Fill Refuse Disposal Franchise Renewed in San Francisco

***Editor's Note**—San Francisco probably has had the longest continuous experience of any municipality with the disposal of refuse by means of sanitary fill. Recently, a second long-term franchise was awarded to the Sanitary Fill Co., a private contractor engaged on the work since 1935. Not the least interesting of the observations recorded in the following story deal with test-pit findings in a ten-year-old fill. Contrary to popular opinion, relatively little organic decomposition had occurred, and virtually no oxidation of metallic materials. For an informative discussion on factors affecting sanitary-fill decomposition see the issue of June 4, 1942, vol. p. 912.*

DISPOSAL of San Francisco's garbage and refuse by fill and cover will be continued for an additional 10 to 20 yr. according to the terms of a new franchise recently awarded. Tests made on the existing fill helped city officials to judge the success of sanitary-fill garbage disposal. Test procedures and results, as well as details of letting the new franchise, are discussed in the following.

Started in 1932 on an experimental basis, the sanitary fill method of disposal proved so satisfactory that a 10-yr. franchise was let which expired Dec. 3, 1945. After the expiration of this contract, San Francisco officials called for bids for a new franchise. The result was the awarding of a new contract, at a higher price, to the firm holding the original franchise, the Sanitary Fill Co. In the interim between Dec. 3, 1945, and the new award, disposal continued on a day-to-day basis under the terms of the old franchise.

Fig. 1. Materials removed from a 10-yr. old sanitary fill show very little decomposition. The newspapers at the top and magazines at the bottom can be easily read. Identifiable in the center are artichoke leaves, feathers, tin cans, an old broom, corn husks and silk, light globe and orange peels.

Franchise bids called

In order that various methods of disposal be considered the San Francisco Board of Supervisors called for bids to be submitted April 29, 1946. Limitations on the bids imposed by city ordinance, revokable only by a vote of the people were a maximum charge of $1.50 per ton for disposal and a ban on dumping at sea.

Two bids were received, both for sanitary fill. The successful bid was for $1.10 a ton delivered at the 16th St. ramp (previous franchise was for $1 a ton) and for 90 cents per ton delivered at the fill. The new agreement covers a 10-year period and will automatically be renewed thereafter on an annual basis for 10 more years unless the city or the contractor gives one-year notice.

The general plan of the fill-and-cover garbage disposal methods and a report on 10 years of experience therewith were given in *ENR* Apr. 22, 1943. vol. p. 554.

Briefly, the sequence of operations is as follows: Scavenger associations or individuals wishing to dispose of garbage or other rubbish deliver it to a centrally located ramp at 16th St. in San Francisco. Trucks are weighed and the charge of $1.10 a ton ($1 under the old franchise) is made at this point. The trucks dump into gondola railroad cars, which carry the garbage to the fill.

The fill is located on bay front mudflats just beyond the southern border

of the city. Some 50 carloads of refuse daily are brought to the fill where they are unloaded by three clamshell cranes. Bulldozers spread the refuse at the edge of the fill and it is covered each day with earth-and-rock cover material. The franchise calls for 2 ft. of cover for 4 ft. of fill. Cover for the 10-yr. period of the old franchise averaged 0.758 cu.yd. per ton of garbage. Succeeding layers of refuse and cover are placed and the surface is left about 10 ft. above the desired finish elevation to provide for future settlement.

The average daily handle is 700 to 800 tons of refuse with peak daily loads of more than 900 tons. Some 400 to 500 cu.yd. of cover material a day is required, which is obtained from a nearby hill. A power shovel and four trucks are used for cover material.

Fill settlement studies

One of the tests made by city officials on the existing fill was a subsidence study started in 1944. Permanent bench marks were located at various places on the fill in order to determine the rate of settlement.

Preliminary results obtained show that settlement for fill made in 1933-34 varies from 0.14 to 0.37 ft. during the last 2 yr. No particular relationship can be noted between the amount of subsidence and the age of the fill, for material filled between 1935 and 1940. Settlement figures for the 2-yr. period vary from 0.58 ft. for material placed in 1937 to 3.88 ft. at a nearby location in 1936.

Variation in the amount of settlement is attributed to the heterogeneous nature of the material deposited. Officials for the Sanitary Fill Co. predict that the settlement may go on for 20 to 100 yr. and that the area will never be suitable for anything but light structures.

10-yr.-old garbage uncovered

To study the physical condition of the fill, a section of 10-yr.-old fill was opened up recently. Two pits were dug. One was started with a ¾-yd. dragline and completed with a 1¼-yd. power shovel, and the other was dug by the shovel. Each pit was about 9 ft. deep and both were located in the area which was filled during 1934 or 1935. In the second pit, alternate layers of dirt and garbage could be seen with planes of separation still clearly defined. The maximum thickness of garbage noted was 1.2 ft., indicating that considerable compaction had resulted.

Garbage and refuse showed very little evidence of decomposition over the 10-yr. period which may be attributed to a lack of oxygen and water in the fill. Cover material effectively seals out the atmosphere and excludes much of the rainfall. Specimens of fruits and vegetables collected appeared to be as fresh as the day they were originally buried and did not exhibit any loss of color. However, when examined closely such items as orange peels were very hard and after a few minutes exposure to fresh air, these "fresh" fruits and vegetables turned black. Newspapers and magazines, except for being damp, were in a good state of preservation. Tin cans were very bright and the absence of traces of rust was notable. Metal showed evidence of some sort of electrolytic or galvanic deterioration, but no rust.

When first uncovered the refuse yielded a musty odor not unlike that observed at some sewage treatment plants. After digging into the garbage the odor was sweet and sickly, best described by one of the participants as a "gorgonzola" or "cheese factory" odor. There was no evidence of hydrogen sulphide gas.

Temperature readings taken at various depths in the trenches varied from 63 deg. F. at ground surface to 72 deg. F. maximum at a depth of 8 ft.

Similar test pits dug in 1939 in a 5-yr.-old section of the fill gave like results. The 10-yr.-old garbage was only slightly more decomposed than the 5-yr.-old.

The slow rate of decomposition led city officials to conclude that subsidence of the fill will continue until organic materials become fully stabilized and that complete stabilization will take many years.

The test pits were dug without cost to the city by the Easley & Brassy Co. who operate the fill for the Sanitary Fill Co., and the tests were made under the direction of Ralph G. Wadsworth, city engineer.

Puerto Rico Sewage Disposal Program Includes Sixteen Treatment Plants

CONTRACTS have been awarded to two United States firms by the Puerto Rico government, through its Puerto Rico Aqueduct and Sewer Service, for sixteen sewage treatment plants, one of which is already under construction.

The Dorr Company, New York, will furnish equipment for nine biofiltration plants and one primary treatment plant, and the Yeomans Brothers Company, of Chicago, will supply equipment for four activated sludge plants and one primary treatment plant. A contract had previously been given to The Dorr Company for the equipment for a biofiltration plant for the city of Lares, which is now being built.

No definite locations have been announced as yet for the remaining new plants, but it is reported that they will be constructed in communities throughout the island where the need is the most urgent. Construction of these sixteen sewage treatment plants by the Puerto Rico Aqueduct and Sewer Service, created by the insular government about two years ago, is the initial move to provide adequate treatment facilities for all communities, ranging in population from 2,000 to over 400,000. The entire program, which also includes an extensive waterworks construction program (*ENR*, Nov. 8, 1945, vol. p. 633) is expected to require fifteen years for completion.

It is expected that building of the new plants will get under way late this fall after design plans have been completed for the concrete structures required to accommodate the mechanical equipment. These plans are being prepared by the aqueduct and sewer service division under the direction of Sergio Cuevas, administrator and chief engineer, San Juan, Puerto Rico.

Unusual design requirements

Due to the rather limited supply of water for domestic use throughout the island, the design requirements of the sewage plants are somewhat different from normal practice in this country. For instance, the plants are designed for an average raw sewage flow of only 60 gpd. per capita, as compared to 100 gpd. per capita frequently used in this country. The maximum per capita hourly flow is 180 gpd.

Design requirements also are based on a raw sewage strength of 340 ppm. 5-day BOD (biochemical oxygen demand). In the primary treatment plants the effluent quality requirement is a maximum of from 170 to 204 ppm. BOD, and in the plants designed for complete treatment, the effluent quality requirement is from 20 to 30 ppm. BOD.

Digestion compartments and tanks will provide a sludge storage capacity of 3.0 cu. ft. per capita. Activated sludge plants will provide 1.25 sq. ft. of area per capita in the sludge drying beds, and the minimum detention period in the settling tanks is required to be not less than 1.5 hr.

Intensive treatment required

Chief reason for the high degree of treatment required in the majority of these sewage plants is that much of the domestic water supply is secured from small streams throughout the island, many of which will receive some of the treated effluents. Intensive treatment of the sewage, therefore, in many cases will result in a lesser load imposed on water filtration plants that take their supply from these streams.

Two of the new plants provide primary treatment only since the effluents will be discharged directly into the sea. These plants include primary settling tanks and sludge digestion units only. In the case of the plant of this type for which The Dorr Company equipment is being used, the primary settling unit will include a flocculator mechanism, so that the treatment may be varied to meet seasonal demands with the aid of chemicals. Population to be served by this plant is 8,000.

The primary plant being equipped with Yeomans Brothers equipment will serve a population of 3,000 persons, and will have a pre-aeration tank, a primary settling tank, and a sludge digestion unit with scum-breaking equipment.

Biofiltration for 9 plants

Nine of the other plants for which Dorr equipment was purchased will be of the single-stage, complete treatment, "Biofilter" type. They will employ the dual or split recirculation feature, in which one half of the total recirculation will be pumped back from the filter effluent to a point ahead of the primary settling tank, and the other half of the recirculated flow will be sent back from a point following the final clarifier to a point ahead of the filter where it will join with the flow from the primary clarifier. The total recirculation in these plants as well as the plant now under construction at Lares is a volume equal to 3 times the average daily flow of which one-half, or 1.5 times the average daily flow, is recycled in each phase of the dual recirculation.

One of these nine biofiltration plants will serve a population of 2,500; three of them will each serve a population of 3,000; two of them of 6,000 each; one each of 7,500, 8,000 and 12,000 population.

In the plants for 2,500, 3,000, and 6,000 population the primary sedimentation units will be Dorr "Clarigesters," with the clarifier compartment at the top and the digestion compartment beneath the clarifier compartment. In these units the sludge collected by the mechanism in the clarifier compartment is discharged into the digestion compartment below continuously and automatically without any pumping. Scum is collected automatically and discharged to the digestion compartments by small pump units.

The other larger biofiltration plants will have circular clarifiers, and due to the equality of the recirculation obtained by the dual method, both the primary and final clarifiers are the same diameter and water depth.

Three are "Packaged Plants"

Three of the activated sludge plants for which Yeomans Brothers Company is providing equipment are to be "packaged" plants, termed "Aerifier" plants. Two of these will be almost identical in size—one to serve a population of 2,000 and the other 2,500 persons. These plants will have a rectangular primary settling tank; a combined aeration and final settling tank, and a digestion unit.

The third "packaged" plant will serve a population of 3,000. It will have a rectangular primary settling tank and two combined aeration-settling tanks and a separate sludge digestion unit.

The final plant using Yeomans Brothers equipment will be a conventional-type activated sludge plant for a population of 6,000. It will employ dual rectangular primary settling tanks, four aeration tanks and dual rectangular settling tanks, and one separate sludge digestion tank.

In addition to furnishing the mechanical equipment, the contracts between the Puerto Rico Aqueduct and Sewer Service provide for the services of engineers from the two equipment companies to supervise the initial operation of the plants and train the operating personnel of each plant.

Traffic Increases Reported In New York and Chicago

Traffic increases averaging 50 percent this year in the two largest U. S. cities reflect a nationwide trend and indicate acute need for expanded off-street parking facilities according to the American Public Works Association.

A recent New York City traffic survey disclosed a record increase of 58 percent in vehicular traffic in and out of the city during the first quarter of 1946 compared to the same period in 1945, and a check of Chicago's central business district traffic revealed a 42 percent increase over 1945.

New York traffic experts emphasized the need for clear streets to reduce traffic tie-ups. Vehicles entering and leaving the city increased from 10,876,485 for the first three months of 1945 to 17,224,485 for the same period this year. Lack of off-street loading facilities for merchandise houses was pointed out as a cause of congestion, as also was the shortage of garages due to wartime conversion into warehouses.

Traffic violations in New York have increased with the traffic rise. During the first five months of this year, 140,085 summonses were issued in the city for traffic violations, 72,554 of them being tickets for parking. During a nine-month period in 1945, 90,355 summonses were issued for all traffic violations.

Chicago's tabulation of vehicles entering the "Loop" business district between 7 a.m. and 7 p.m. on a typical work-day revealed an increase of 42 percent over a similar day last year. Increase of passenger car traffic—including taxis—was from 84,467 vehicles to 115,224 vehicles, a 36 percent rise. Service vehicles—delivery trucks, etc.—increased from 11,035 per sample day in 1945 to 22,525 for the 1946 test day, an increase of more than 100 percent.

Concrete Pipe Jacked Under a Railroad

***Contents in Brief**—Hydraulic jacking of 75 ft. of 48-in. concrete sewer pipe under a railroad fill was simplified by carefully planning and controlling all operations. Maximum pressure reached a total of 185 tons.*

HYDRAULIC JACKING was the only method permitted in the recent installation of a large concrete pipe beneath five main-line tracks of the Pennsylvania Railroad at 105th St. and Indianapolis Blvd., Chicago. An efficiently designed jacking assembly, a simple cutting shield and well-planned construction procedure reduced the job to a simple operation, requiring only a six-man crew.

A total length of 75 ft. of 48-in. extra strength, reinforced concrete pipe was jacked beneath the railroad tracks. Pipe sections were tongue-and-groove, 5 ft. long, weighing 750 lb. per foot. An additional 40 ft. of pipe was installed in open cut outside of the tracks. The pipe will serve as a conduit and access tunnel to carry an 8-in. water line and an 18-in. cast iron sewer from a manufacturing plant of the Columbia Malting Co., located nearby, to existing city facilities. A manhole at each terminal provides access to the tunnel.

The nature of the soil (fine sand with a small amount of gravel), together with the fact that the top of pipe is only 5½ ft. below base of rail made the jacking method superior to any other. An open cut was prohibited due to the large amount of traffic (from 70 to 75 high-speed passenger trains and heavy freights per day). Moreover, braced tunneling was not permitted by the railroad due to the possibility of settlement of the tracks.

Hydraulic ram; 6-ft. stroke

All jacking was done from a sheeted and braced open pit, 10 ft. wide, 15 ft. long and 12 ft. deep, located just outside of the westbound mainline track. Pressure was applied to the jacking unit by a shop-made oil-operated hydraulic ram, capable of producing 10,000 psi., or a total pressure of 265 tons to the end of the concrete pipe. The ram had a 6-ft. stroke, which was particularly desirable for installing the 5-ft. pipe sections. It was double acting, and operated by a gasoline-engine-powered, single-plunger pump operating on a crankshaft, with four available speeds provided through an automotive transmission.

The hydraulic ram was anchored in place against a 35-sq. ft. "backstop" containing two upright grillages of railroad ties, bolted and spiked together and set flush with the ground. The outer grillage contained 7-ft. ties set on end with one 10-in. face next to the undisturbed sand and gravel. The inner grillage was made of 5-ft. ties tiered horizontally with one 7-in. face bearing against the outer grillage. Three 8-in. steel H-beams, 5 ft. long then were placed vertically between the inner grillage of ties and a 16x16x2-in. steel thrust plate welded to the rear of the compression chamber, to transfer the back pressure from the ram to the backstop.

Extreme care was exercised in fabricating the timber bearing block between the ram and the concrete pipe. It was made of two oak timber assemblies, each 4 in. thick. The inner assembly was accurately fabricated to fit the curved and beveled tongue of the pipe. Particular care was taken to insure its bearing on the solid end of pipe wall, with no pressure being applied to the projecting 4-in. lip forming the inside surface of the pipe, as this lip might spall under the applied pressure.

The outer half of the bearing block was an eight-sided segmental assembly of 4x14-in. oak timbers bolted to the curved assembly. It was notched at the bottom to clear timber guide skids, which supported each pipe section as jacking started.

To complete the bearing block as-

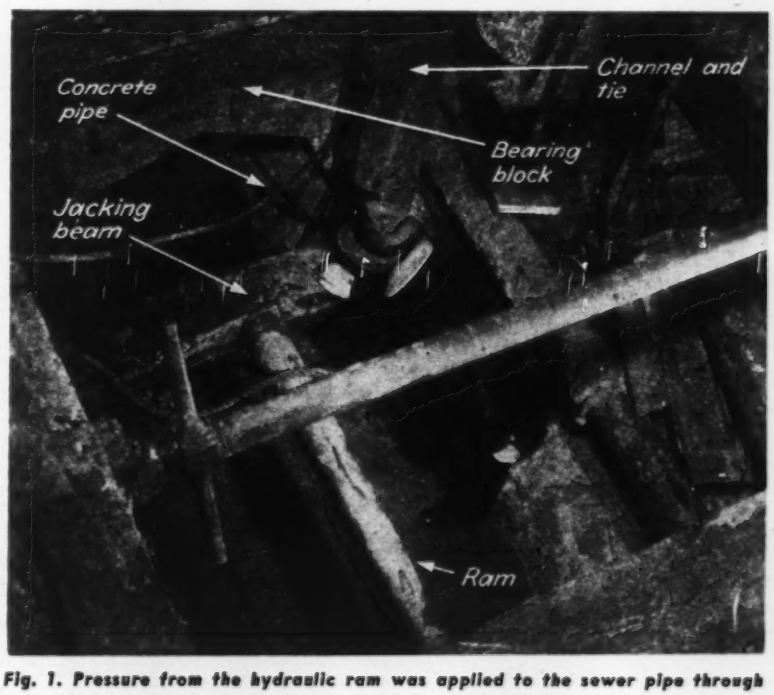

Fig. 1. Pressure from the hydraulic ram was applied to the sewer pipe through a horizontal steel beam, vertical channels and railroad ties, and a special oak bearing-block assembly.

sembly, two 7x10-in. railroad ties, each faced with a heavy 12-in. channel on the side next to the ram, were installed vertically 4 ft. 5 in. c. to c. to bear against the segmental oak timbers.

A heavy steel jacking beam was fabricated to deliver the pressure from the ram to the channel-faced ties of the bearing block assembly. It included an 8-in., 58-lb. H-beam, installed horizontally with its centerline about 2 in. below the centerline of pipe. One flange of the jacking beam bore against the vertical channels, the other against the ram. Added resistance to bending was built into the beam by welding $\frac{1}{2}$-in. diaphragms at 12-in. centers between web and flanges. A $\frac{1}{2}$-in. plate also was welded between the outer edges of the flanges to make the beam function as a boxed girder.

The hydraulic ram was installed in the jacking pit so that the axis of its piston coincided with the horizontal axis of the jacking beam, directly under the centerline of the concrete pipe. The 6-in. dia. ram was centered in correct position against the jacking beam by a 2-in. length of 6-in. dia. pipe welded to the outer flange of the beam. All jacking was done against the tongue end of the pipe sections.

Semi-circular cutting shield

A simple but efficient cutting shield was mounted on the outer end of the first pipe section installed. It was a $\frac{3}{8}$-in. semi-circular steel plate 30 in. wide, projecting 18 in. past the end of the pipe, and shaped like a bonnet. It was bolted to the upper half of the pipe with five $\frac{3}{4}$-in bolts, 7 in. long, extending through holes drilled in the pipe. The shield was held snug against the end of the pipe by a $2\frac{1}{2}$x$2\frac{1}{2}$x$\frac{3}{8}$-in. angle welded to the inner face of the shield and curved to fit the end of the pipe. A 2-in. width of $\frac{3}{8}$-in. plate was welded to the inner leg of the angle to fit the beveled surface of the projecting lip of the grooved end of the pipe. The bonnet shield also served to protect the miner from any loose gravel falling when excavating just forward of the leading pipe.

Simple gantry handled pipe

No shield was used on the lower half of the pipe for two reasons. One, was that its absence expedited hand excavating in front of the pipe. The other was that better control of line and grade could be secured, since a cutting edge on the bottom of the pipe might tend to make the pipe dip as it was progressively jacked through the undisturbed fill.

The sections of concrete pipe, weighing 3,750 lb. each, were delivered at the site by trailer truck and stored adjacent to the jacking pit. From there they were rolled to the edge of the pit, picked up by a chain hoist suspended from a double A-frame gantry and lowered into position on two 6x6-in. guide timbers installed in the pit. The top, inside edge of these timbers were faced with a light steel angle on which the pipe rested prior to jacking.

The gantry, consisting of an 8-in. I-beam mounted between timber A-frames and equipped with a manually operated 2-ton chain hoist traveling on a trolley, was built long enough to extend about 5 ft. past one edge of the pit to facilitate picking up the pipe. Wire rope slings, encircling the pipe, were used to swing it into position. When these slings became wedged between the pipe and the guide skids as each pipe section was lowered into the pit their release was effected by throwing a hemp rope sling around the tongue end of the pipe and lifting that end sufficiently to clear the skids.

Since elliptical reinforcement had been used in the manufacture of the pipe, each section had to be placed in position with care being taken to insure the upper part being at the top. Accordingly, the wire rope slings were placed around the pipe in such a manner that when it was lifted by the gantry it would rotate sufficiently to be in correct position vertically.

Wellpoints kept work dry

Excavation continued in front of the cutting shield as the pipe was progressively jacked under the tracks. The sand and gravel was shoveled into a wheelbarrow, transported to the jacking pit and scaffolded out onto the ground where it was trucked to a spoil area. The tunnel was lighted with a string of lights and the entire jacking pit was kept reasonably dry at all times by a series of ten wellpoints, connected to a 3-in. header pipe leading to a suction pump. Normal groundwater level was one foot above bottom of pipe. The group of wellpoints in the pit

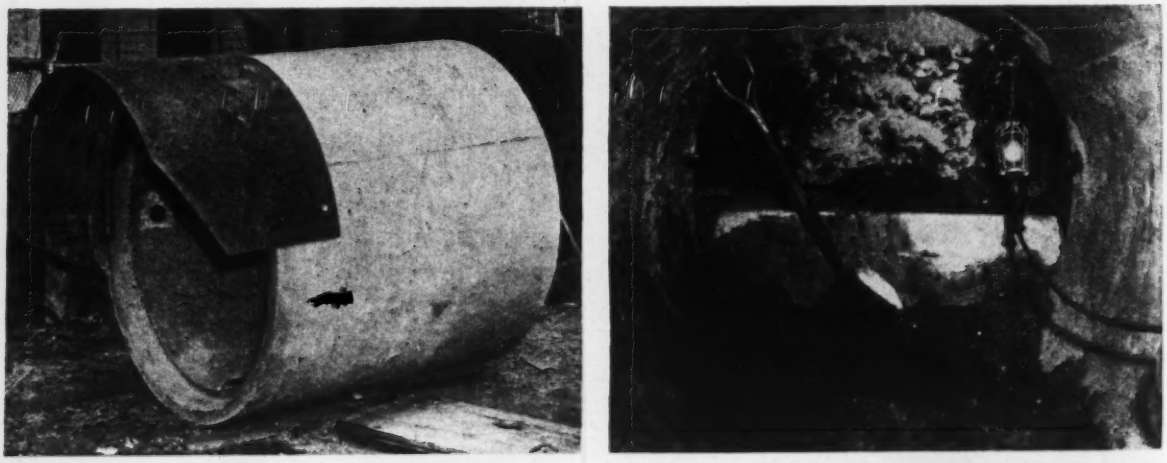

Fig. 2. Excavation ahead of the pipe was protected by a metal shield bolted to the top half of the lead section (left), while a timber header (right) prevented sloughing of the railroad embankment when operations were discontinued at night.

Fig. 3. All jacking was done with a shop-assembled hydraulic ram capable of exerting a 265-ton pressure on the concrete pipe. The heavy thrust plate, shown at the extreme left, bore directly against a timber backstop grillage.

permitted dewatering the tunnel to a distance of about 50 ft. away. It was found necessary, however, to install additional wellpoints at that location between the tracks when the tunnel bottom started getting wet, as it was important to keep the tunnel heading dry when excavating and jacking.

Controlled grade and alignment

The pipe was installed on approximately a level grade. Its alignment, both vertically and horizontally, was controlled by loosely excavating on one side of the front edge of the pipe, as necessary, supplemented by hand jacking the cutting edge in the desired direction of adjustment, usually upward, as the pipe was inched forward under pressure from the ram.

Pressure was applied practically continuously from the time jacking started, Nov. 20, 1945, until the entire 75 ft. of pipe was in place. The pressure against the bearing block increased progressively as the work proceeded. It reached 4,800 psi., or a total of 127 tons, at the end of 55 ft. of installed pipe, and a maximum of 7,000 psi., or 185 tons total, for the last section installed. It was noticed throughout the job that the passage of heavy freight or fast passenger trains reduced, momentarily, the gage reading on the ram from 200 to 500 psi. Apparently this was the result of vibration of the fill material decreasing the skin friction on the periphery of the pipe.

A minimum of 500 psi. (gage pressure) ordinarily was maintained between work shifts as a safeguard against excessive skin friction developing between the pipe and the surrounding fill. It was noted, however, that the pipe actually started to move as easily, or even easier, after all pressure had been released overnight. This phenomenon was attributed to the fact that the several trains passing above the installed pipe during the night might have compacted the fill material surrounding the pipe in such a manner as to reduce skin friction. Only a single 8-hour work-shift daily was employed, due to limited manpower.

All joints were calked with an asphaltic asbestos jointing compound. Prior to installation, the entire grooved end of each pipe section was coated with an asphaltic primer and about ½ in. of calking compound was applied to the exposed end of the outer rim of the pipe. The remainder of the joint was applied from the inside after the pipe was installed.

It was originally intended to jack 90 ft. of pipe from the single set-up, in one direction, if at all possible, which would have traversed the two fast passenger main line tracks, three freight tracks and one work-train spur. However, an incident occurred when 75 ft. of pipe was in place which prevented this. The earth behind the timber backstop gave way when the jacking pressure reached 7,000 psi. causing the jacking unit to rise at the forward end producing a slight bend in the ram.

The ram was in an extended position, completing the push on a section of pipe, when the reaction occurred, so it was susceptible and in an unfavorable position to resist bending. The subsidence was not altogether unanticipated, as the location of the pit and backstop area (partly in filled ground) were dictated by clearances available. These did not permit locating the backstop in a more desirable area.

The remaining pipe under the outer freight track was laid in open cut, without interruption, by supporting the track on double rail stringers which the railroad had available.

A contract for the job was held by the O. Scully Co., of Chicago. The work was performed under the direct supervision of Lawrence Scully, a partner in the company. I. L. Wise, consulting engineer, Chicago, represented the owners.

Meters in Parking Lots Reduce Operating Costs

Parking meters in city-operated parking lots now allow maintenance expenses for these facilities at Miami Beach, Fla., to vary automatically with population changes, according to the American Municipal Association. The new parking system is designed also to reduce traffic and parking congestion during the tourist season, when the city's population soars from 30,000 to 100,000.

Meter fees are graduated according to location. In one large lot parkers in the rows nearest the stores pay five cents for 60 min., while the same fee buys 90 min. parking time in slightly less convenient locations. Twenty-five cents provides all-day parking in some spaces.

The meter plan is supplemented by parking permits. During the tourist season, monthly parking permits for use in lots only may be purchased for $3 per month. For the remainder of the year the fee is an additional $3.

Fig. 1. Trained crews rehabilitate Cincinnati's old streets under traffic with hot asphalt and stone chip seal.

Cincinnati Protects its Streets by Extensive Resurfacing and Sealing

***Contents in Brief**—In an effort to catch up on its street maintenance program, delayed during the war, Cincinnati is engaging in one of the largest resurfacing programs in its history. Resurfacing old pavement with both hot-mix and cold-mix asphaltic concrete receives the greatest attention, with surface treating following a close second. Sheet asphalt, recut granite block and paving brick are used extensively to maintain heavily traveled pavement in street railway track areas.*

FACED with the necessity of maintaining an ever increasing mileage of city streets in constant need of repairs, Cincinnati is concentrating on a large program of pavement resurfacing and surface treatment. This year's program includes 540,000 sq. yd. of machine-placed bituminous paving and 1,000,000 sq. yd. of asphalt surface treatment with stone chip seal. Other major items of street repair include 125,000 sq. yd. of sheet asphalt resurfacing (hand-placed); 210,000 sq. yd. of cold-mix asphaltic concrete, by hand; 50,000 sq. yd. of granite block paving; 10,000 sq. yd. of brick paving; and 20,000 sq. yd. of concrete pavement to be adjusted by mudjacking.

Despite the increases in materials costs and wages, present unit costs of certain items of street maintenance and repair show a distinct downward trend and compare quite favorably with prewar costs. Much of this is attributed to greater efficiency through mechanization and standardization of methods. Just how current costs compare with those of 1941 and also with the average costs during the past five years are indicated in Table I.

Costs shown in the table include labor, materials and established rental rates on equipment. Overhead, which averages 16 percent, is not included. For comparison, the cost of work done in the month of May has been used in all instances.

In setting up each yearly program of street maintenance, the first and most important questions are (1) the amount of funds that will be made available for the work and (2) distribution of the funds between the five maintenance sections of the division: hard paving, macadam paving, structures, sewers and street cleaning.

The estimated amount of money for

the work is prepared well in advance. This estimate is prepared by June 1 for the following year. For 1946, the highway maintenance division's total appropriation from the city's budget, secured from motor vehicle tax, motor fuel tax and general property tax, is $1,505,000. Of this amount, $850,000 has been allotted to street maintenance and repair. In addition, the division will receive about $300,000 revenue for work it does for other city departments and private utility companies, such as track repair work for the street railway company.

After the amount of funds is estimated, the next and equally important problem is to determine the allocation of funds to the several units of street repair, and determine how much of each can be done with the money available.

The number of units of work to be done is based on the previous year's cost for each type of repair, modified by any anticipated price trends. Obviously, considerable emphasis must be placed each year on bituminous machine paving and resurfacing of existing streets as these two operations provide the greatest service to the public for the least expenditure of money.

Priority of Improvements

Both the amount of street repair that needs to be done and the priority in which it should be programmed are secured from several sources. The general supervisor of each of the five maintenance sections of the division of highway maintenance prepares a detailed report showing the amount and recommended priority of making the necessary improvements. Usually this exceeds, in dollar value, the amount of his budget. By reference to the master list of all streets, which indicates their maintenance to date, the recommendations are pared down to the budget allowances.

The priority of making the street repairs also is governed by their position on the schedule of permanent improvements and the effect of the improvement of a portion of a traffic artery on the balance of that artery. Another important source of information are requests by citizens for the repair of old streets. It is not uncommon to receive 4,000 such requests, mostly by telephone, in the course of a year. Each complaint is investigated and a report made to the complaining

TABLE I—UNIT COSTS OF HIGHWAY MAINTENANCE

(For the Month of May—Exclusive of Overhead)

Operation	Unit	Cost 1946	Cost 1941	Cost 5-year average 1941-1945
Hand paving with asphalt:				
On old concrete	sq. yd.	$0.47	$0.72	$0.48
On old asphalt	" "	0.48	0.75	0.54
Machine paving:				
Hot mix	" "	0.30	0.34	0.35
Cold mix	" "	0.29	0.28	0.32
Surface treatment	" "	0.058	0.042	0.047
Concrete pavement:				
Mudjacking (raising slabs)	" "	0.34	0.43	0.44
Repair concrete base	" "	1.71	3.21	3.46
" " surface (patching)	" "	4.86	7.50	4.07
Crack sealing	100 lin. ft.	0.19	0.21	0.24
Repair expansion joints	100 lin. ft.	1.43	....	0.91
Adjust castings	each	9.83	4.88	10.98
Replace concrete curb and gutter	lin. ft.	1.59	0.95	1.24
Block paving:				
Brick	sq. yd.	2.42	1.65	2.05
Granite	" "	2.02	1.57	2.30
Sealing joints	" "	0.07	....	0.16
Resetting curb	lin. ft.	3.16	1.42	1.53
Bituminous concrete (hand paving):				
On asphalt	sq. yd.	0.70	0.61	0.72
On bituminous macadam	" "	0.36	0.26	0.33
On boulders	" "	0.34	0.51	0.43
On brick	" "	0.53	0.24	0.51
On wood block	" "	0.69	0.69	0.73
On granite	" "	0.69	0.54	0.64
On concrete	" "	0.91	1.17	0.81
Restoration of utility street openings:				
Asphalt with asphalt	" "	1.23	1.07	.086
Concrete surface	" "	8.53	5.37	7.00
Concrete base	" "	6.12	3.27	4.57
Brick paving	" "	2.48	2.10	2.60
Granite paving	" "	3.39	1.99	2.25
Macadam with bituminous concrete	" "	2.32	0.86	1.24
Concrete " " " ..	" "	0.94	0.91	1.45
Miscellaneous:				
Erecting guard rail	lin. ft.	1.11	0.40	0.98
Repainting traffic lines	100 lin ft.	1.25	1.00	1.36

Fig. 2. Bituminous machine paving, either hot-mix or cold-mix, adds at least ten years' life to many old pavements. The work is scheduled so as to interfere with traffic as little as possible, especially during morning and evening rush hours.

citizen telling him the probable nature of the improvement and approximately when it will be made.

In resurfacing old pavement with bituminous macadam the division of highway maintenance has found it more economical and less hazardous to traffic to delay raising the existing gratings and manhole covers for utility facilities until after the new surfacing has been laid. Consequently, the manholes are left in position and completely covered, and their positions marked with a thin wooden block pressed into the new street surface during rolling.

Each block has burned into its top surface the letter "W," "G," "S," or "T," signifying that the underlying installation is either a water, gas, sewer or telephone facility. Upon completion of the resurfacing the foreman in charge of the work submits copies of a report showing the location and classification of each manhole or grating that has been covered by the new asphalt surfacing. These copies are routed to the various public utilities who are required to raise the fixtures to the proper elevations at their own expense.

Center line markers are removed and reset by city forces.

Large bituminous paving program

From the standpoint of permanent improvement, bituminous paving of old street surfaces probably is the highway maintenance division's major activity. The 1946 program calls for some 540,000 sq. yd. (equivalent to 38 miles of 24-ft. pavement) of this work to be done at an estimated cost of $0.30 per sq. yd. It consists primarily of applying 1 to 1½ in. of hot-mix or cold-mix bituminous macadam over a light asphaltic "tack" coat. And it is applicable to the rehabilitation of all kinds of old pavements including portland-cement concrete, brick, penetration macadam, water-bound macadam, and asphaltic concrete.

Typical of the work was a project under construction during August involving the placing of a cold-mix bituminous mat on an old penetration macadam pavement. Following a check to see that no major repair was planned for any public or private utility passing beneath the street to be repaired, the first step was to thoroughly clean the old surface by power broom and street flusher. Then a light tack coat of cutback asphalt emulsion was applied at the rate of 1/20 gal. per sq. yd., following which the bituminous macadam was laid and rolled. Final operation was the hand surfacing of intersecting street approaches to meet the new pavement grade.

The cold-mix bituminous macadam was delivered to an asphalt paver by eleven 5-ton trucks, from the city's two asphalt plants located about four miles from the job. After being spread, the new surfacing was given an initial rolling with a 10-ton, three-wheel roller, and final rolling by a 10-ton, tandem roller. A typical crew, including a foreman, three equipment operators, seven laborers and eleven truck drivers, can lay 500 tons of bituminous paving in eight hours, which is equivalent to about 8,700 sq. yd. of 1-in. thick surfacing.

Surface treatment

Next to resurfacing with bituminous machine paving, the largest item of street maintenance is surface treatment of old and severly cracked bituminous pavement. Some 1,000,000 sq. yd. of this work is included in this year's program at an estimated cost of $0.058 per sq. yd. Ordinarily, it consists of sealing the old pavement with hot asphalt and covering it with stone chips.

The work is programmed so as to cause a minimum of interference to the public, but even then each resurfacing project brings a large number of complaints from adjacent home owners who object to the inconvenience caused by dust from the chip seal, and from motorists who complain about driving on the freshly repaired streets. After the improvement has been completed, however, they have little trouble realizing its value.

In general, surface treating of major traffic arteries is avoided during peak traffic hours, and most of it is done between 9 a.m. and 4 p.m., since the streets under repair are rarely closed to traffic. Another precaution which is taken to keep traffic moving at maximum volume is to avoid surface treating the in-bound lanes in

TABLE II—GRADATIONS OF BITUMINOUS AGGREGATES

Sand for bituminous concrete:							
Screen size	3/8-in.	#4	#8	#16	#30	#50	#100
Percent passing	100	90–100	65–95	40–80	20–60	10–40	10 (Max.)
Fine aggregate for surface treatment:							
Screen size					1/4-in.	#8	#16
Aggregate No. 6 for surface treatment of bituminous concrete:							
Screen size				1/2-in.	3/8-in.	#4	#8
Percent passing				100	90–100	10–35	0.5
Aggregate No. 4 for bituminous concrete:							
Screen size			1-in.	3/4-in.	1/2-in.	3/8-in.	#4
Percent passing			100	80–95	40–65	20–45	0–5
Sand or slag for mineral cover (percent):							
Retained on #16 screen							Zero
Passing #16 retained on #50							40–60
" #50 " " #100							20–35
" #100 " " #200							15–25
" #200							0.5
Aggregate, medium, for surface treatment (percent):							
Retained on 1/2-in. screen							Zero
Passing 1/2-in. retained on 3/8-in.							0–10
" 3/8-in. " " #3							10–20
" #3 " " #10							65–80
" #10							0.8
Paving pebbles in brick and granite street maintenance (percent):							
Retained on 1/2-in. screen							Zero
Passing 1/2-in. retained on 3/8-in.							30–40
" 3/8-in. " #3							40–50
" #3 " " #4							5–10
" #4							0–5
Filler dust in sheet asphalt (percent):							
Retained on #80 screen							Zero
Passing #80 retained on #200							0–20
" #200							80 (Min.)

Maximum size of pea gravel in bituminous surfacing and surface treatment is 3/8-in.

the morning or out-bound lanes in the late afternoon.

Surface treating operations usually follow a standard procedure. First, a check is made with the sewer and water departments of the city, and the gas and electric public utilities to ascertain if they contemplate major repairs to their underground facilities passing beneath the street to be improved. If such is the case, the surface treating is postponed until the underground repairs have been made.

Standard procedure followed

After decision has been made to proceed with the work, the first operation is to thoroughly clean the old pavement by power flusher and mechanical sweepers, augmented by such hand sweeping as is necessary. All cleaning is done from 24 to 48 hours in advance of the application of asphalt, in order to insure the old pavement being dry.

Prior to the regular surface treatment, all irregularities and low spots are filled with a bituminous binder until the old pavement rides well. Also, utility manhole gratings and covers are painted with old lubricating oil and covered with aggregate to prevent adhesion of the asphalt seal. Next, the asphalt seal is applied with a pressure distributor, using a slow-curing asphalt emulsion on bituminous macadam, a fast-breaking emulsion on concrete and brick paving, and either a cutback asphalt or a cut-back tar on sheet asphalt pavement. Rate of application for both types of pavement is 0.25 gal. per sq. yd.

The final operation is to cover the fresh asphalt seal with about 20 lb. of stone chips per square yard by use of a mechanical spreader, followed by rolling with 5-ton and 10-ton rollers. Ordinarily the rollers are equipped with stiff brooms to level up the layer of stone chips and to force excess material into low spots in the pavement.

An efficient crew of about 11 laborers, four equipment operators, six truck drivers and a foreman can apply 2,250 to 2,500 sq. yd. of surface treatment per hour using the following equipment; one 1,000-gal. pressure distributor, one 1,000-gal. asphalt supply truck; five 5-ton dump trucks, one 5-ton and one 10-ton roller, and one crushed stone spreader.

Fig. 4. Heavily traveled track areas are repaved with recut granite block. Some 50,000 sq. yd. of this work will be done this year.

Maintenance of the street surface between and adjacent to the city's street railway tracks is a continually difficult problem. In many instances, where both rails and ties require replacement, the entire track area is rehabilitated as a joint venture between the city and the street car company. Most of the city's share of this work is done by contract.

But where the rails and ties are in good condition, rehabilitation of the track area is done by the highway maintenance division using both sheet asphalt and granite block or brick paving. Under this year's program, some 50,000 sq. yd. or granite block will be removed, trimmed to a uniform depth and relaid at an estimated cost of $2.60 per sq. yd. Under the same program, 10,000 sq. yd. of brick paving will be replaced at $2.40 per sq. yd.

In relaying granite block, the typical crew consists of a foreman (who also serves as paver), a rammer, one truck driver, a tar kettle attendant and three laborers. Such a crew sets an average of 1,050 blocks in eight hours to cover 30 sq. yd. of street surface.

The granite blocks are salvaged from old stones, whose upper corners have become rounded from years of heavy traffic. They are hand-cut to uniform size with square corners, and reset on a 1-in. sand cushion. All intervening cracks are filled with a graded gravel and sealed with hot tar.

Although the laying of hand-placed granite block pavement is as old as street construction itself, it still affords the best means of providing a durable pavement in certain street car areas subjected to heavy truck traffic.

Sheet asphalt in track zones

Repair of existing bituminous pavement in street railway zones is a major undertaking each year. Ordinarily, these repairs are made with limestone bituminous binder and a sheet asphalt wearing surface. Some 125,000 sq. yd. of this resurfacing is contained in the 1946 program at an estimated cost of $0.63 per sq. yd.

In most cases, the area so repaired

includes the pavement between the car tracks and extends 4 ft. beyond the outer rails. Briefly, the procedure includes removal of the old bituminous pavement, by burner or by pneumatic cutting tools, to a depth of 1 to 2 in. The exposed area is well broomed and ½ to 1½ in. of hot-mix bituminous binder is placed to level all irregularities in the base. The binder is compacted by roller and hand tamper, following which it is sprinkled lightly with a liquid asphalt and covered with about 1 in. (before compaction) of sheet asphalt, which is compacted by power rollers to conform to the adjacent street surface.

Watertight joint necessary

Jointing the new sheet asphalt surface with the existing bituminous mat is of particular importance in this work. It is done by chipping a groove 1 in. deep and about 2 in. wide along the edge of the new bituminous binder after it has been laid. The side of the groove adjacent to the old bituminous surface is cut vertical and the other side is cut on a slight bevel toward the car tracks. Then, as the sheet asphalt wearing surface is laid and rolled it is forced into the groove to form a watertight joint with the existing pavement. The groove is liberally coated with hot liquid asphalt just prior to laying the sheet asphalt and then carefully "ironed" to insure a good bond between the old and the new surfacing materials.

Due to the unavoidable and continued interference from street railway traffic, only about 400 sq. yd. of this type of street repair can be accomplished per crew in an 8-hr. day. A typical crew consists of a paving foreman, two truck drivers, one rollerman, two rakers, two tamper men, two shovelers, one sweeperman, one kettle man and a "lute" man who smoothes the completed joint between the new sheet asphalt and the old bituminous street surfacing.

All materials for street resurfacing are purchased from commercial producers, and must conform strictly to the Ohio State Highway Department's standard materials specifications, with a few variations in gradation to permit more widespread use of local materials. Gradation requirements for resurfacing and surface treating aggregates are shown in Table II.

The city produces its own bituminous paving material in two plants, one of which has a capacity of 60 tons of hot-mix per hour and the other, 30 tons per hour. Production capacities for cold-mix bituminous material are slightly less.

Mudjacking operations

As would be expected from the nature of the subsoil in Cincinnati, considerable mudjacking of concrete pavement is required to maintain pavements at the proper grade and to control pavement pumping during wet weather. The division of highway maintenance has two crews for this work each consisting of a foreman, one mudjack operator, a hose man, one truck driver and three laborers. Some 20,000 sq. yd. of pavement adjustment by mudjacking is included in this year's street repair program.

At present the pumping medium is a slurry containing one sack of cement per cubic yard of sandy loam. However, the division plans to experiment with the use of a liquid asphalt as a pumping medium in mudjacking.

Usual practice in stabilizing the subsoil or raising a section of pavement, which ordinarily measures 10 to 12 ft. wide and 15 to 20 ft. long, is to drill one 2½-in. hole at each corner about 18 in. in from the edges, and one hole in the center of the pavement. The slurry then is forced under the slab through these five holes, with care being taken to avoid sudden and excessive lifts that might crack the slab.

Many old-time employees

Perhaps the greatest contributing factor in the continued efficiency of the highway maintenance division is the loyalty of its key personnel. Except for the disturbance caused by the war, there has been practically no turnover in this category, which involves some 60 employees and includes all those serving in a supervisory capacity from top management down to and including classified foreman.

At present there are some 550 employees in the entire highway maintenance division. About 300 of these are classified as laborers, of which 150 have been with the city for a great number of years. As would be expected, the greatest monthly turnover in the fluctuating common labor occurs in the late spring, summer and early fall. During the first four months of this year it was fairly static with a minimum number of resignations. In July, however, 79 laborers were added to the division's payrolls, while 47 quit for various reasons.

At present, operators of motor equipment are sorely needed and the division is experiencing considerable difficulty in maintaining sufficient experienced personnel to man its motor equipment. Chief cause of this emergency is that local contractors and private industry are offering large premium payments for labor in this particular category. A continuous training program has been initiated to qualify interested and able personnel as equipment operators.

Equipment operators and laborers are employed on an hourly basis while foremen and supervisors are paid a yearly wage. Some representative wage rates paid by the division of highway maintenance are as follows:

Classification	Rate per Hour
Highway maintenance laborer	$0.765
Truck driver	$0.815 to 0.875
Concrete trimmer	0.875 to 0.925
Asphalt heater	0.875 to 1.025
Paving rammer	0.925 to 1.025
Motor equipment operator	0.975 to 1.125
Paver	1.425
Cement finisher	1.55
Painter	1.70

Annual salaries paid to foremen and supervisors vary from $2,050 to $3,520. Specifically, they are:

Classification	Yearly salary
Macadam foreman	$2,050 to $2,190
Labor foreman	2,250 to 2,520
Hard-paving foreman	2,390 to 2,650
General foreman	2,780 to 3,030
Supervisor	3,160 to 3,520

All the city employees were granted a flat "cost of living" bonus of $24 per month effective Aug. 16, 1946, pending a study of classifications and compensations. This bonus is in addition to the foregoing table of wages and salaries.

Engineering personnel

C. E. Brokaw is superintendent of the division of highway maintenance. He is assisted by R. C. Lewis. R. G. Sarvis is director of public works, H. H. Kranz is city engineer and W. R. Kellogg is city manager.

The Sanitary Engineer Looks Forward

***Editor's Note**—The following extracts from an address by Abel Wolman, professor of sanitary engineering, The Johns Hopkins University, and chairman of the Sanitary Engineering Committee of the Pan American Sanitary Bureau, provide a stimulating discussion of the opportunities and responsibilities faced by sanitary engineers. Sympathetic consideration of these views should aid in strengthening the capacity and position of the sanitary engineer in the field of public health activities.*

ENVIRONMENTAL SANITATION under controls administered by the sanitary engineer offers the greatest possible source of accomplishment in the reduction of worldwide misery and death. This was the conclusion reached by Abel Wolman in an address before the first Inter-American Regional Conference of Santary Engineers at Rio de Janeiro, Brazil (*ENR* July 4, vol. p. 4).

Mr. Wolman stated that the statistical implications of environmental disease (such as malaria, typhoid, typhus, dysentery, cholera and plague) reveal that these diseases—which are subject to controls by the engineer—will be by far the most important health problems confronting the world for many decades.

It is not an exaggeration to say that Great Britain, France and the United States of North America will all derive advantages from the effective control of yellow fever or malaria. While China or Iran would no doubt benefit from the sanitary engineering experience of the western world, this does not mean that the western world itself is living in a Utopia freed of the necessities of controlling the environmental diseases.

How problems differ

This much only can be said, that in these countries, blessed with rich resources, with organized public service and with a rapid rate of public works installation, progress in the control of the environmental diseases has been more rapid. How to transmit these blessings to countries or parts of countries historically less favored thus becomes perhaps one of the most important future assignments of the statesman in sanitation.

The differences in problems throughout the world are those of timing, of finance, of social organization and public persuasion. Challenges such as these to the sanitary engineer are not limited by political boundaries, by language, by racial differences or by economic philosophy. They must be met on each ground within the framework of geographical and political settings. It is still true, as Prof. George C. Whipple pointed out many years ago, that "The world is bound in bacterial bonds." To break these bonds requires energy and perspective on a worldwide basis and not upon a nationalistic adherence to geographical or political limits.

To discover future possibilities and necessities for sanitary engineering functions, one need only to turn to a review of the diseases that disable and kill the world. What are they, where do they occur, and when may they be conquered with the resources now available?

In a recent discussion of China's health problems, Dr. Szeming Sze points out that on any one day among the 400,000,000 people of China 16,000,000 persons are sick; over 10,000,000 people die every year. He estimates that of the 10,000,000 deaths 4,000,000 are unnecessary and probably three-quarters of these unnecessary deaths are attributable to the excessive incidence of gastro-intestinal diseases, the infectious causes of infant mortality and pulmonary tuberculosis. No inconsiderable portion of this morbidity and mortality is due to the absence of any of the elementary provisions for protection of water supply, for the elimination of sanitary wastes or for the control of insect-born disease.

In India, the situation is more than paralleled. Conditions, of course, are parallel in almost every country of the globe where the diseases of filth still reign supreme as the major cause of death and of misery while still alive.

Many observers have already pointed out that these problems of the environment cannot be disposed of or masked by referring to them as "tropical diseases." They are neither tropical in origin nor restricted by latitude. Historic accident may emphasize their tropical location, but the conditions which engender them cannot be easily or accurately relegated to the tropics.

No one, of course, discounts the relationship of geography to disease, but in the field in which we are today active, the future holds challenges to the sanitary engineer that are not circumscribed by the tropics or by the remote areas of the world.

If we were to review the statistical implications of environmental diseases of the world as a whole, we cannot escape the conviction that the diseases subject to control by the engineer will be by far the most important health problems confronting the world for many decades. It is not too much to say that the greatest probable source of accomplishment in the reduction of morbidity and mortality in the world would be through environmental sanitation.

Future functions of the engineer

It should be reasonably obvious that the engineer of the future is confronted with both an unlimited task and an engrossing opportunity. His function for the future in the fields of water supply, sewerage, air control, housing, insect control, rodent control, remain essentially the same. Their geographical spread, their rate of application, their expansion and understanding will all need to be speeded up.

One of the great difficulties in the control of environmental diseases is that any effective procedure requires money. The pernicious cycle of

disease to poverty to disease represents perhaps one of the most important challenges to the sanitary engineer. What are the devices by which environmental structures may be designed, constructed and operated more cheaply than they now are? By what measure is it possible to reduce the unit cost of purifying water, of treating sewage, of controlling insects and rodents?

In some of these fields, the war fortunately has produced possibilities of materials and of equipment which are less expensive than those available before the war. Some of these have immediate application and use in the control of environment diseases. The engineer, however, must develop new techniques of financing which would make it possible for governments throughout the world to apply the known solutions to the devastating problems of disease.

It has long been my judgment that too little study has been given to financial procedures. These matters have been too frequently relegated to administrative officers unfamiliar with their importance or insufficiently ingenious to develop new procedures for paying for sanitary installations. The provision of money is an essential sanitary engineering objective which must be emphasized for speeding up future activities.

Administration is important

Of almost equal importance in the introduction of sanitary reforms in any country is the development of the administrative structure necessary to execute and to operate the installations required. Here, too, political philosophy dominates the scene.

There is perhaps no general law, other than that of expediency, which will determine how much local autonomy and responsibility should prevail in contrast with the responsibilities of the central government.

In this field, too, the sanitary engineer has a part to play. He must familiarize himself with the lessons of other countries in administrative management and structures. He cannot, of course, slavishly apply the lessons of other countries to the solution of the problems of his own country. He can, however, suggest and devise administrative structures which would facilitate the managerial phases of environmental sanitation.

To accomplish the objectives all too briefly discussed, the development of sanitary engineering staffs will be required. Such development will place upon the universities of the Americas a task which cannot be lightly treated. Here, too, this group should in the not too distant future evaluate the requirements, the status and type of education and training which will be demanded for the most effective practice of sanitary engineering.

A necessary concomitant of a program of education for professional workers lies in the field of research. Much remains to be discovered in the general field of environmental sanitation. Many investigative tasks are still ahead. Fundamental data on many activities are still lacking.

All of us are aware that the sanitary engineer not only has a struggle with the physical environment, but has likewise the task of strengthening his capacity and his position in the field of public health activity. This cannot be accomplished by sleight of hand. His status in the future, whether strong or weak, will rest upon the quality of his equipment and of his performance.

Cardboard Salvage from Refuse Reduces Bulk on Landfills

Continuation of the wartime paper shortage has moved cardboard to the fore among materials that can be salvaged from garbage and other refuse en route to disposal in sanitary fills. The accompanying pictures, taken recently on a fill operated by the city of Seattle, Wash., are typical of what goes on at several of the ten such fills now maintained in that city. Six of the ten are operated by garbage disposal contractors and four by the city.

The paper shortage creates such a demand for paperboard that it is now worth while for salvage operators to employ workmen on the Seattle fills to separate and bundle up cardboard that can be reprocessed. This salvage operation does not bring the city any remuneration. Cardboard salvage men are allowed to work on the fills, within supervised limits, without pay to the city because their operations reduce the city's cost for spreading and covering.

Seattle garbage disposal costs are high because of the relatively high haulage cost. The amount actually spent on the fills is kept relatively low by reason of a segregation plan which routes combustible refuse, particularly industrial wastes, to designated disposal areas. One typical burning dump operates about one-half mile of fill, roughly semicircular in plan, where fires ordinarily burn most of the time. This fill is handled by one man who looks after the fires and directs the dumping of contractors as well as firms or individuals who may bring in combustible refuse for disposal. This fill will accept small quantities of oil and also some metal junk.

Cardboard cartons, tossed aside when garbage and refuse is dumped, constitute a considerable portion of the bulk on this Seattle sanitary fill.

Elevated Tank Design Simplified by Conical Base and Tubular Legs

***Contents in Brief**—Architectural simplicity and structural stability have been incorporated in an elevated water tank designed to resist wind forces by direct compression and tension in the supporting columns.*

ELEVATED water tanks, which are often a hundred feet or more in height, are conspicuous not only to those who live around them but to passersby as well. With good architectural treatment such tanks readily become a point of civic pride; when their appearance is disregarded, they become "just another water tank."

Into the first category falls a recently completed all-welded elevated water tank at Winona Lake, Ind., installed by the Northern Indiana Public Service Co. Attractive in appearance, this conispherical tank incorporates a novel design that includes a tubular-legged tripod supporting tower. Although a tripod is an age-old method of support, its use on such a structure is new.

The Winona Lake tank has a capacity of 150,000 gal., with the high liquid level 103 ft. above the foundations. The tank is 34 ft. in dia. with a 28-ft. range of head. The supporting tower consists of three tubular columns 54 in. in dia. and 75 ft. high. There also is a central riser which is 48 in. in diameter.

No wind bracing needed

The extension of the center lines of the three columns of the tower intersect at the centroid of the wind forces on the tank, so that all wind loads are carried by direct compression and tension in the columns. This permits the omission of struts and rods used on a standard elevated tank tower.

To obtain proper stiffness for the columns, which have an unsupported length of 69 ft., it was found advantageous to use tubular members. They also were designed to resist the bending imposed by the wind blowing on the columns themselves.

The intersection of the tripod with the tank bottom is accomplished by a design in which all the tower columns connect to a frustum of a cone. The load is transferred from the conical bottom of the tank to this cone frustum by the use of a compression ring.

Another feature of this tank is the use of one of the columns to house the ladder leading to the top. An access tube inside the tank extends from the top of this column up through the water, making it possible to climb to the very top of the tank without being on the outside surface.

The Winona Lake tank was erected by a stiff-leg derrick, shop fabricated sections of the tower columns being welded together on the ground. The columns then were raised individually and fitted together at the top to the cone frustum. The tank bottom then was erected using the derrick to place sections of plates, which had been welded together on the ground. The shell plates of the tank were raised individually by the derrick.

A similar type tank of 250,000-gal. capacity and supported on a four-post tower was built at Warsaw, Ind., an adjoining municipality served by the same water supply system. It is 40 ft. in dia. with a water depth of 31½ ft. The four steel tubular supporting columns are 54 in. in dia. and the central riser is 48 in. in dia. The high liquid level is 116 ft. above the foundations.

Although the water supply system serves both towns, the two tanks were installed as an aid in equalizing the pressure in the mains, particularly during peak loads. Moreover, there is an appreciable difference in elevation between the two towns.

Water for Warsaw and Winona Lake is secured from a lake near the center of Warsaw, and chemically treated and filtered in a purification plant at the main pumping station. Prior to installation of the two new water tanks, the treated water was pumped directly into the distribution system. A wide variation in pressure resulted, often as much as from 14 to 45 psi. Following installation of the tanks, the pressure remained fairly constant around 36 to 38 psi.

Both water tanks were designed and fabricated by the Chicago Bridge and Iron Co., Chicago, Ill. Robert Mitchell was in charge of erecting the tank at Warsaw and L. P. Kuffel supervised construction of the one at Winona Lake.

Supported on a tripod of tubular columns, the nearly completed Winona Lake water tank (left) has a storage capacity of 150,000 gal. The completed Warsaw tank (right) is of similar design except it has a capacity of 250,000 gal. and is supported on four columns.

Check-Valves End Water-Hammer Risk

H. A. Knudson
Engineer in Charge, Mechanical & Electrical Division
East Bay Municipal Utility District, Oakland, Calif.

***Contents in Brief**—Planning a pumping station to increase aqueduct flow presented a problem which was solved recently in California by installation of swing check valves to prevent water hammer should power for pumping fail. Increased flow was necessary to meet extra demand caused by wartime population and industrial expansion of Oakland, Calif., and nearby cities.*

AN UNUSUAL INSTALLATION of swing check valves provided the solution for a water-hammer problem resulting from the insertion of pumps in a gravity-flow aqueduct to increase its capacity. This extra flow was required by the East Bay Municipal Utility District, which supplies water for Oakland, Calif., and other cities nearby, because of increased water demand due to wartime population and industrial growth. Installation of an additional pumping plant along the aqueduct, as described herein, boosted the capacity of the system from 69 mgd. to 95 mgd.

Water consumption in the East Bay district increased about 50 percent from 1941 to 1943 (Fig. 1). As this increase was greater than anticipated it threatened to overtax the available supply. Accordingly, planning for additional pumping facilities at Bixler, Calif., some 20 miles west of Stockton, was started in 1943 and final tests were run on the plant early in 1946.

The main water supply for Oakland and surrounding cities comes from the Pardee Reservoir in the foothills of the Sierra-Nevada Mountains through an aqueduct some 84 miles long. This steel pipe aqueduct was designed for gravity flow with a capacity of 42.5 mgd. Capacity was increased to 69 mgd. by the installation of the Walnut Creek pumping plant some years ago, when increased demand required additional capacity, a still further increase in capacity was made by means of a second pumping plant rather than by installation of another steel pipeline. (Because of the wartime materials situation.) Priorities were obtainable for the pumping plant because an adequate water supply was vital to the operation of many industrial and military installations in the San Francisco East Bay area.

As the aqueduct was originally designed for gravity flow working pressures, the discharge pressure of the new booster plant was limited (Fig. 2). Thus, the location of the plant became a matter of determining the point where maximum increase of capacity could be obtained without exceeding the limiting pressures. As foundation conditions precluded the construction of the plant on the site that satisfied hydraulic conditions, the plant was located some 2,500 ft. downstream.

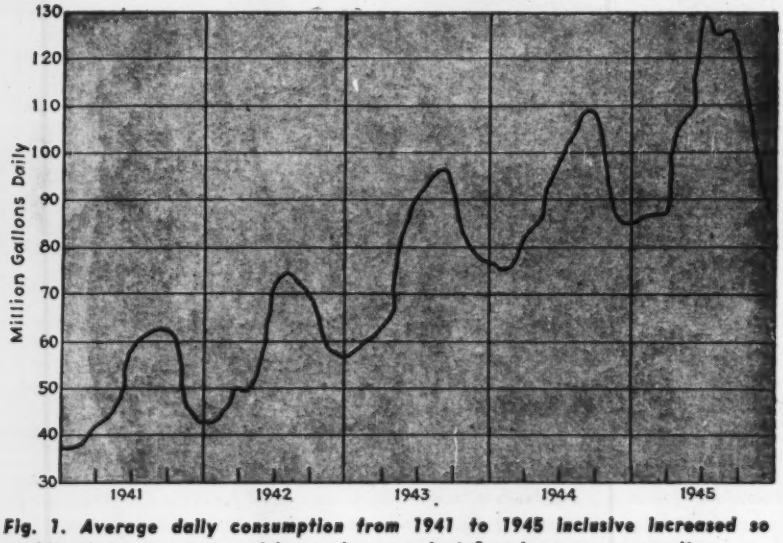

Fig. 1. Average daily consumption from 1941 to 1945 inclusive increased so rapidly that some means of increasing aqueduct flow became a necessity.

Water hammer problem

Experience in the operation of the aqueduct had demonstrated that pressures of destructive magnitude can be generated by rapid changes in flow unless careful control is maintained. Such control was relatively simple at the Walnut Creek plant where two pipelines were installed between the pumping plant and the discharge chamber, a rise of some 285 ft. One of the lines is open at all times to gravity flow; the other is on the discharge side of the pumps and can be used only for pumped water. When the pumps are operating, the gravity flow line is almost empty; and, on shutting down the pumps, it acts as a surge chamber, gradually filling due to the pressure in the line. Thus the flow in the main line is retarded at such a rate that water hammer is prevented.

As the flat terrain at the site of the new plant did not permit such an arrangement for surge prevention, two multiple disk swing check valves were installed on a plant bypass. These handle the transition from the pump flow to the lower velocity of gravity flow with minimum accompanying

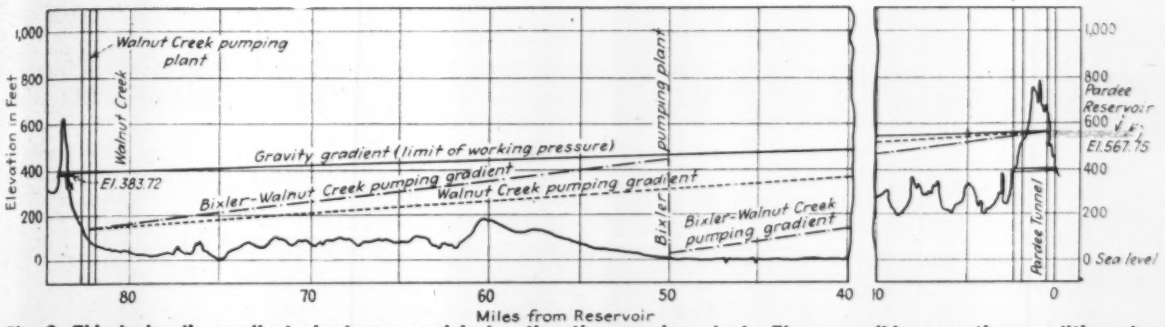

Fig. 2. This hydraulic gradient chart was used in locating the pumping plant. Three possible operating conditions for the aqueduct are shown, namely: (1) Gravity flow, (2) pumping plant near end of line in operation, and (3) both pumping plants in operation. The second pumping plant was installed at Bixler, about 50 miles below the reservoir.

pressure rises or surges. Use of the swing check valves was based on experience with a similar installation of less capacity, substantiated by calculations and later by tests on the completed plant.

The multiple disk check valves are of standard design and are so installed that, when pumps are operating, the greater pressure on the downstream side holds the valve closed. However, when the pumps are suddenly stopped, downstream pressure becomes less than upstream pressure and the multiple disks are forced open, permitting aqueduct flow to continue at a gradually diminishing rate. This transition in flow is accomplished with only a slight pressure fluctuation, which occurs well within safe operating limits.

In the case of the Bixler pumping plant, the main line is 65 in. in diameter. As a valve of this size could not be obtained, two valves were installed. A 54-in. valve was placed on a plant bypass and a 36-in. valve in a location provided for a future spare pump.

Underground pumping plant

In order to take advantage of as much suction pressure as possible, the pumps are below ground surface. At Bixler, ground surface is 14 ft. above sea level, the aqueduct invert is +4.5 ft., and the pump center lines were located at —2 ft.

To accommodate such an arrangement of pumps with the quantity of excavation kept to a minimum and to permit as much of the electrical equipment as possible to be installed above ground, a vertical-shaft pump was selected. Pumping equipment installed consists of two single-stage, double-suction, double-volute centrifugal pumps, each direct-connected to a 900-rpm., 400-hp. synchronous motor. Each pump is rated at 47.5 mgd. against a head of 415 ft.

To conserve materials further, out-of-door construction was used. Thus the motors, starters and other main switching equipment were installed in outdoor cubicles. A small building was required for housing operating devices.

The plant is operated on a semi-automatic basis. It must be started manually, but will stop when any one of a number of predetermined abnor-

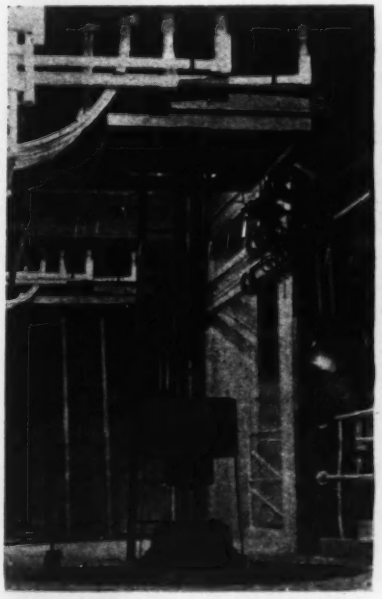

Fig. 3. Pumps were installed underground to take advantage of the existing head on the aqueduct.

Fig. 4. This multiple disk swing check valve was installed on a pumping plant bypass to protect the line from water hammer caused by a pump shutdown and to permit flow of water while pumps are not in operation.

mal conditions obtain, such as an overheated bearing, high temperature in the motor windings, failure of cooling water flow, failure of lubricating oil flow, or shutdown of the Walnut Creek pumping plant. Shutdown from causes other than power failure is accomplished by the closing of pump discharge throttling valves, which action trips the power supply to the pump motors.

To start the Bixler booster plant all main valves must be in proper position and the cooling water and lubricating oil systems must be operating, otherwise connecting interlocks would prevent the operation of the electrical starting equipment for the main motors. The plant is also prevented from starting unless the Walnut Creek pumping plant is operating with two units at normal capacity, 65 to 70 mgd. An additional pump at Walnut Creek takes up the extra flow caused by operation of the Bixler plant.

The plant was designed by the staff of the East Bay Municipal Utility District, for which J. S. Longwell is chief engineer and general manager, and the author is engineer in charge of the electrical and mechanical division. The W. A. Bechtel Co. of San Francisco, built the structure and the Abbett Electric Co. of Emeryville, Calif., installed the equipment.

Typhoid Vanishing in U. S. Cities

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The Typhoid Honor Roll for 1945, published in the July 6 issue of *The Journal* of the American Medical Association, should be no less gratifying to engineers than it is to physicians. The honor roll, which has not been published since 1942, lists 48 of the 96 largest cities of the United States as having no deaths from typhoid in 1945. Of these, 41 were on the honor roll for both 1944 and 1945; 30 have been listed for 3 to 11 years.

Of the 38 cities not on the 1945 honor roll the typhoid death rate per 100,000 population ranged from 0.1 to 1.9 for all cities except one. The rate for Richmond, Va., was 2.14, but by using local population counts instead of the United States census for 1940 the rate was 1.8 for 1945 and only 1.2 for 1941-45. Moreover, some of the Richmond typhoid deaths were non-residents and thus not chargeable to local conditions. The same was true of some of the other cities not on the honor roll.

CLASSIFICATION OF CITIES BY DEATH RATES FROM TYPHOID IN 1945

HONOR ROLL: NO TYPHOID DEATHS

Akron	Elizabeth	Kansas City, Mo.	Portland	Syracuse
Albany	El Paso	Long Beach	Providence	Tacoma
Bridgeport	Erie	Lowell	Reading	Toledo
Buffalo	Evansville	Lynn	Rochester	Trenton
Canton	Fall River	Memphis	Salt Lake City	Tulsa
Cambridge	Flint	Milwaukee	San Diego	Utica
Charlotte	Fort Wayne	Minneapolis	Scranton	Waterbury
Chattanooga	Gary	New Haven	Somerville	Wichita
Cleveland	Grand Rapids	Oakland	South Bend	Worcester
Denver	Hartford	Oklahoma City	Spokane	Yonkers
Des Moines	Jersey City	Paterson	Springfield	Youngstown
Duluth	Kansas City, Kan.	Peoria		

First Rank: From 0.1 to 1.9 per 100,000

Boston..... 0.1	Los Angeles.... 0.3	Newark..... 0.5	Knoxville..... 0.9*
Chicago..... 0.1	Seattle..... 0.3	Fort Worth..... 0.6	New Bedford... 0.9
Detroit..... 0.1*	St. Paul..... 0.3	Jacksonville.... 0.6	Sacramento..... 0.9
New York..... 0.1	Washington..... 0.3	Louisville..... 0.6†	Wilmington..... 0.9*
St. Louis..... 0.1	Cincinnati..... 0.4†	Miami..... 0.6	Atlanta..... 1.0†
Baltimore..... 0.2†	Omaha..... 0.4	Nashville..... 0.6*	New Orleans.... 1.2*
San Francisco... 0.2	Pittsburgh..... 0.4	Philadelphia.... 0.6	Camden..... 1.7†
Columbus..... 0.3*	San Antonio.... 0.4	Norfolk..... 0.7	Tampa..... 1.8
Dallas..... 0.3	Dayton..... 0.5	Houston..... 0.8†	Birmingham.... 1.9†
Indianapolis.... 0.3*			

Second Rank: From 2.0 to 2.1 per 100,000

Richmond..... 2.1†

* All typhoid deaths stated to be in non-residents.
† One third or more of reported deaths stated to be in non-residents.

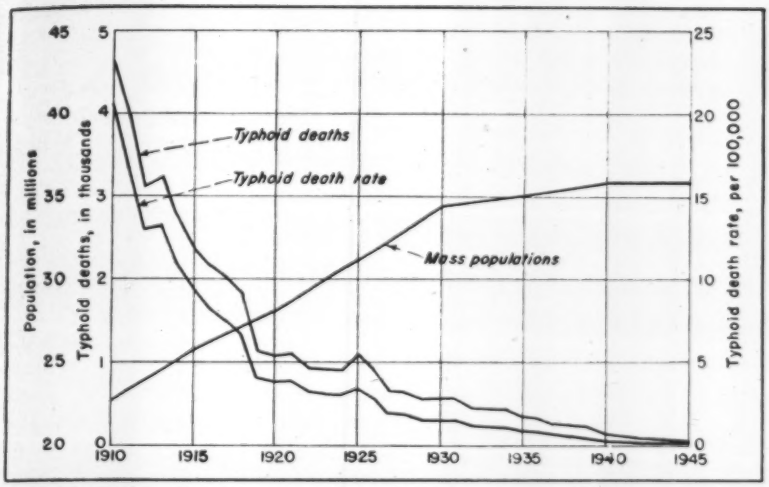
In the six New England states 12 of the 14 largest cities were on the 1945 honor roll. For the two others, Boston and New Bedford, Mass., the typhoid death rate was 0.1 and 0.9 per 100,000, respectively.

From 1910 to 1945 the accompanying graph shows that typhoid deaths in the 78 cities for which figures for every year are available fell from 4,637 to 80 and the typhoid death rate from 20.51 to 0.22 per 100,000. If the 1910 rate had prevailed in 1945 a total of 7,355 victims of typhoid would have gone to their graves.

Richmond's typhoid death rate of 2.14 in 1945 is small compared with the high rates of many cities in the 1890's. In 1892, just before the World's Columbian Exposition, Chicago had the appalling typhoid death rate of 166.4 per 100,000. Six other American cities had rates above 100 per 100,000 for the same year. During the last two decades of the nineteenth century many cities had typhoid death rates exceeding that figure.

Preventive measures count

Reduction of the shamefully high American typhoid death rates before 1910 to the rate of 20.54 per 100,000 in that year is in large part due to the efforts of sanitary engineers. They have played an important role in eliminating the deadly typhoid germ from water, milk and other food supplies. This has been done by bringing water from distant uncontaminated sources



Mass population, typhoid deaths and death rate curves for 78 of the largest U. S. cities during the years 1910 through 1945. (From table in the "Journal" of the American Medical Assn., July 6, 1946.)

or, when that is not possible, by filtering and chlorinating water from sources nearby. In addition, sanitary engineers have abolished privy vaults and the associated food-contaminating typhoid fly by building sewage collecting systems, have lessened pollution of water supplies by constructing sewage treatment works, and have promoted the installation of milk pasteurization plants. All these they have operated skillfully, ably assisted by chemists and bacteriologists.

In assessing causes for vanishing typhoid the bedside work of devoted and well-trained physicians and nurses should be remembered. But except for anti-typhoid inoculation their efforts are remedial. The work of the engineer is preventive—and an ounce of prevention is worth a pound of cure.

Baltimore's Salty Ground Water Blamed on Faulty Well Structures

VERTICAL leakage down faulty wells is the most serious cause of salt-water contamination of artesian well supplies in Baltimore and its environs. This is the conclusion of a report on "Ground Water in the Baltimore Industrial Area" recently published by the Maryland State Planning Commission.

Five outstanding difficulties accompany use of ground water in the Baltimore area. In order of their importance these are: (1) salt-water contamination; (2) acid contamination; (3) drop in static levels; (4) decline in discharge, and (5) loss of wells due to collapse of the well screens and casings or of the ground outside of the screens.

Two types of chloride contamination are apparent. In some instances salt water enters the aquifers through submarine outcrops and abandoned wells, this condition of general contamination being rather stable as far as spreading is concerned. In other places the deep aquifers are still fresh. It is in these areas that many wells are contaminated by leakage of shallow salty water down faultily sealed wells and abandoned wells. The condition is intensified by heavy pumping of the lower aquifers, which lowers static pressures holding the upper water bodies in balance. Downward flow of these contaminated liquids is thus accelerated.

A similar condition exists in respect to contamination of deep aquifers by leakage from shallow acid waters. This in turn is one of the causative factors in the loss of wells due to screen and casing collapse.

The report points out that proper use of cement grout is the only practicable method of controlling this leakage from contaminated shallow water-bearing formations into deeper aquifers. On the practical side in helping present and prospective ground-water users in the area, the report describes in detail many of the techniques developed in the oil industry for using cement grout in construction, repair and sealing of wells.

Unless these methods are adopted and the leakage stopped, according to the report, most of the ground-water supplies in the Baltimore industrial area will sooner or later have to be abandoned as sources of fresh water. However, if these or other methods equally as good are used, salt contamination problems in the area gradually should be brought under control.

The report was prepared by John C. Geyer for the Maryland State Planning Commission, of which Abel Wolman is chairman and I. A. Pasarew is director.

Report Available on New Duplicating Process

A new "parchment master reproduction" process, developed by the Army Service Forces for duplicating forms, drawings, and typewritten or longhand data, is described in a manual now on sale by the Office of Technical Services, Department of Commerce. The new process offers considerable savings in time, money, personnel and space.

In this process, an inexpensive, 60-lb. long-gran parchment paper, similar to paper for wrapping butter, is used to prepare masters for offset reproduction. These masters may be made from photographic plates, from other masters, or by direct image from a typewriter, pencil, or ink. Only ordinary offset duplicating equipment is required. Copies are reproduced much as in other offset work.

Full descriptions of the process and its advantages, together with illustrative photographs, are contained in the manual, which is designated as "Report PB-19195." Orders for the report should be addressed to the Office of Technical Services, Dept. of Commerce, Washington 25, D. C.

Dredge Cleans Waterworks Basin Without Interrupting Service

***Contents in Brief**—A half-million cubic yard silt deposit was hydraulically dredged from the sedimentation basin of a water treatment plant in Philadelphia, Pa., without interrupting service or increasing turbidity. Dredged material was used to fill adjacent land planned as the site of plant extensions. Existing storm sewers were used as regulatory drains in the disposal area.*

AN UNUSUAL PROBLEM confronted water bureau officials in Philadelphia, Pa., when a 50-yr. accumulation of silt had to be removed from the sedimentation basin of the Queen Lane water treatment plant. Not only was it necessary to continue the basin in service while removing more than a half-million cubic yards of sediment, but it was also imperative that there be no increase in turbidity of the basin effluent. There was an equally difficult problem in the matter of disposing of the silt as it was removed from the basin.

This question of silt disposal proved to be one of the main points on which hung the decision as to the method used in carrying out the work. When all factors were taken into consideration, an electrically-operated suction dredge (Fig. 1) was indicated as the best means for removing the sediment and depositing it as a hydraulic fill within a specially constructed impounding basin on adjacent city-owned property.

The Queen Lane plant, one of the largest and most important in Philadelphia's waterworks system, processes about 120 mgd. of the 325 mgd. supplied to the city. Raw water for the plant is pumped from the Schuylkill River and carries a heavy pollution load in addition to being, at times, highly turbid. Treatment consists of coagulation with alum, sedimentation, pre-filtration in rapid sand filters, followed by "polishing" filters of the slow sand type. Chlorination is used for bacteria and algae control.

The basin to be cleaned is a rectangular reservoir about 1,100 ft. long, 600 ft. wide and 30 ft. deep. Its capacity is nominally 177 mg., but after 50 years of continuous use as a settling basin for the Schuylkill River water that capacity had been reduced to about 70 mg.

This sizeable reduction in capacity, resulting from deposition of about 540,000 cu. yd. of silt on the basin bottom, is not so surprising when it is realized that the raw water has an average daily turbidity of 100 ppm.—this is 830 lb. of suspended solids per million gallons of water. Furthermore, turbidity records show monthly averages three to four times as great as the daily average, and daily samples have run as high as 3,800 ppm. Removal of 85 to 90 percent of such turbidity in the settling basin after chemical coagulation accounts for the large accumulation of sediment.

The hydraulic dredging method previously had been used to clean the sedimentation basin of the city's Torresdale plant (*ENR* Feb. 22, 1945, vol. p. 260). At Torresdale, however, it was possible to float the dredge from the Delaware River into the basin after a short section of earth dike separating them had been temporarily removed. At Queen Lane the dredge had to be assembled on the site.

This was covered in the job contract, which also called for the contractor to furnish all power lines required for operation of his dredge. In addition, he was required to construct the impounding basin for the disposal of the dredged materials on city-owned property across a street from the treatment plant.

Of special interest was the method of constructing and draining the disposal basin. Earth from the disposal area was used to build up the embankments, which ranged from 20 to 55 ft. in height above ground level. This variation in height was due to the irregularity of the ground, since the dike tops were maintained level.

As no core walls were required, draglines were used to build up the embankments, whose inside and outside slopes were 1½ to 1. Top width

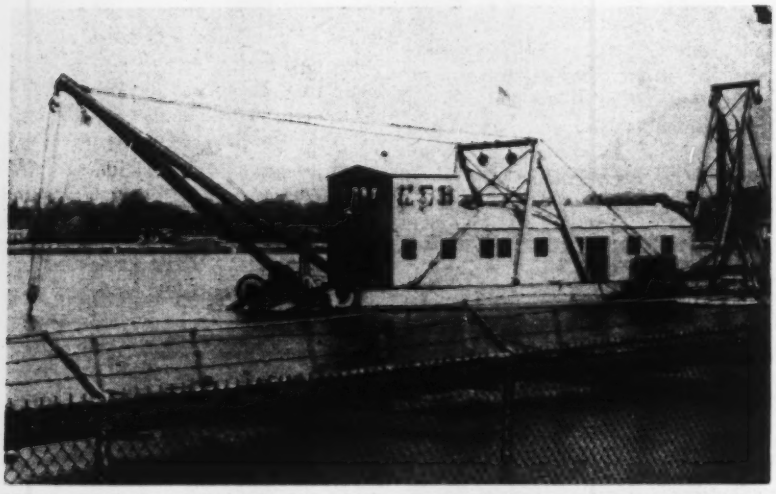


Fig. 1. The hull of this 16-in. electrically operated dredge cleaning land-locked waterworks basin was hauled overland in five sections and bolted together at site of the work.

generally was only enough for operation of the dragline, but where the banks were adjacent to public streets a minimum of 12 ft. was specified. Dike construction, which was accomplished between November 1945 and February 1946, required 242,000 cu. yd. of earth.

Drainage of the discharge water from the disposal area was possible through existing large storm sewers. These sewers run under the site at a considerable depth.

Manholes from the sewers were extended until their tops were nearly level with the embankment tops—and some 100 ft. above the sewer (Fig. 2). Concrete sewer pipe was used for the manhole extensions in all except two cases, which were specially built as drain inlets to regulate the depth of water over the silt in the impounding area.

These two drainage manholes were built up with special 4-ft. concrete pipe sections, each of which provided four rectangular openings 12 in. high and 24 in. wide (Fig. 3). Radial sides on the openings insured a tight fit for concrete closure plugs when outside water pressed against them. Using precast closure plugs, the openings could be closed as needed to raise the water level in the area. Cat walks from the top of the dike to the drainage manholes provided access for inspection and for insertion of the closure plugs as the deposited material built up.

Fig. 2. High earth dikes around the disposal area confined the silt-laden discharge. Manholes for a large storm sewer under the area were built up of concrete-pipe sections before placing the hydraulic fill.

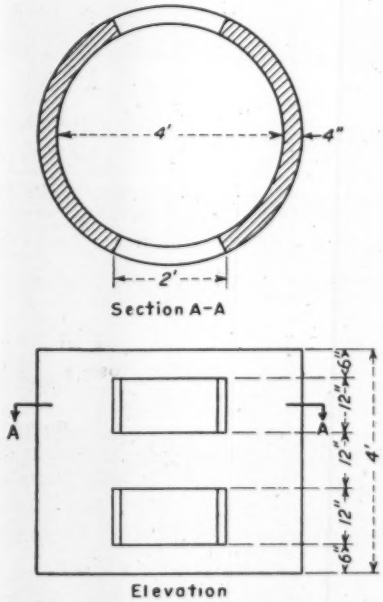


Fig. 3. Special pipe sections for the drainage manhole provided openings used as overflow weirs. These openings were later closed by concrete plugs as needed to maintain settling pond depth.

Scouring of the sewer and the base of the inlet manholes, due to the 100-ft. drop of the waste water, was prevented by hanging a series of temporary horizontal baffles in these manholes to dissipate the energy of the falling water.

For the dredging work, the contractor built a demountable 15-in., 600-hp., electrically operated suction dredge designed especially for this contract. Five welded steel sections were hauled to the reservoir by truck, then bolted together to form the hull. Machinery and superstructure were then installed.

To prevent injury to the concrete slab and asphalt construction of the sedimentation bottom, a steel shoe was fastened to the dredging boom. This prevented contact of the cutter blades with the reservoir bottom. But as an added precaution the dredging was carried out in two steps; the first to within a few feet of the bottom, the second, close to the base.

Also to prevent slab injury, the dredge spuds were fitted with special square-end shoes. These easily held the dredge in place, yet movement was readily accomplished by hauling in or slacking off on tie lines attached to deadmen strategically located around the reservoir.

At no time was the operation of the dredge responsible for any difficulty with water turbidity. The precautions in this regard included assembling the discharge line in the longest length needed for the entire dredging operation. Thus, breaking of the discharge line to install additional length was eliminated, removing the possibility of spillage from that source.

Ordinarily, 1½ to 2 ft. of the silt-laden dredge discharge was held above the settled silt in the disposal area to accelerate settling. In this way, turbidity of the waste-water overflow was kept to a maximum of 50 ppm., or less than that of the Schuylkill River, into which it was discharged through the drainage sewer.

The filled disposal area will be utilized as a site for an extension to the existing plant, scheduled for construction under a $18,000,000 waterworks rehabilitation program already approved. This work is planned to strengthen supply, treatment and distribution phases of the system regardless of whether existing sources are continued in use or one of the upland sources now being considered (*ENR* Jan. 24, 1946, vol. p. 138) is adopted.

Payment under the contract was on the basis of yardage of material removed, measured in place before work began. Under these conditions the successful bidder quoted a unit price of 97c. per cu. yd.

Contractor for the work was the Eastern Engineering Co., of Atlantic City, N. J. For the city, Martin J. McLaughlin is director of public works; Elbert J. Taylor and Joseph E. Gill are chief engineer and principal assistant engineer, respectively, of the water bureau.

SOME ESSENTIALS OF

Turbine-Generator Foundation Design

Contents in Brief—Aside from strength and durability requirements, a good foundation for turbine-generators must be laid out so as to accommodate the main machine and its accessories for convenient operation and servicing. In addition, it must be designed to keep vibration at a minimum. Some simplifying design assumptions and construction practices that have given satisfactory results are recommended.

DESIGN of turbine-generator foundations involves more than providing for heavy, main machine loads and keeping vibration to a minimum. Actually, shaping the foundation to accommodate the machine and its accessories for convenient operation and servicing is a major design consideration. In general, the complex nature of the problems involved requires reliance upon design practices suggested by past experience and by equipment manufacturers. The following information was supplied by the General Electric Co. of Schenectady, N. Y.

Turbine-generator units come in all shapes and sizes. They may be high speed or low speed, condensing units or "toppers", simple, compounded across, tandem or vertically, and may have house generators and exciters strung along the shaft. An ordinary unit weighs more than 500 tons and has a rotating element of about one-fifth that weight. Difficulties that are unusual in other types of construction are common to the installation of almost every turbine unit.

Condenser controls shape

General styling of the supporting structure hinges largely upon the types and arrangement of auxiliary equipment used. For example, the foundation height usually is determined by the present practice of inserting a condenser directly beneath the turbine. To this one feature, plus the desire to avoid excessive height, may be attributed many of the structural difficulties encountered. Any reduction in height, with the practices now in vogue, increases congestion because of the multiplicity of pipe runs and the space requirements for air-cooling and various types of auxiliary equipment.

In some cases, a dominant feature is the orientation of the steam condenser. An arrangement with the condenser tubing at 90 deg. to the turbine shaft has many advantages and is used most often. Longitudinal condenser layouts, on the other hand, preclude effective cross-bracing of the foundation, whereas hydrogen-cooled units, having some advantage in this respect, have worked out very well in longitudinal arrangements. Non-condensing units, of course, present no such problem.

Also affecting the shape is the material of which the support is to be made. Foundation materials have been limited to bare structural steel, reinforced concrete, and structural steel encased in reinforced concrete. Each has its advantages and its particular application, and all may be considered to have been successful when well engineered and constructed. At last reports, however, about 80 percent of turbine foundations were of concrete.

Problems of steel foundations

The choice of materials used for structures, in some instances, depends upon the question of space conservation. Where a limited amount of space is available for a station, it is commonly believed that more capacity may be installed in a given space if bare structural steel is used for the foundation. One outstanding advantage of the structural steel frame is that difficult details require less room than is necessary with the use of reinforced concrete. In addition, electric-arc welding offers possibilities for the improvement of many steel details previously riveted, and it is quite possible that, as congestion becomes more and more acute, there will be a trend toward its use.

In laying out a steel structure, it is often impossible to locate members in the proper positions for supporting the machines, and it has been found that steel structures are usually not so simple as might be expected. Layout difficulties have led to filling the deck with concrete to form a suitable surface for supporting and grouting the machine, a desirable practice providing sufficient thickness is used.

Another disadvantage in the use of steel for turbine-generator foundations is that it has practically no vibration-damping property and is characterized by a "sense of liveliness", even if not actually resonant. Also, to reduce deflections, it is necessary to use what in common practice would be considered absurdly low unit stresses.

Concrete provides rigidity

Reinforced concrete, without employing excessively conservative unit stresses, gives rugged and massive construction. It braces itself to a large degree, provides suitable bearing surfaces for the machine parts and has the inherent ability to damp out vibrations to an appreciable extent.

A structural steel frame encased in reinforced concrete may have the advantages of both the other types if well constructed and will conserve space as well, since the concrete encasement will have smaller overall dimensions than the corresponding reinforced concrete structure. However, when dealing with low-speed machines, it is quite possible that the additional stiffness of such a structure may bring it within the realm of resonance, and this feature must be investigated.

Additional economies might also be had by reducing the areas required in the steel sections if this will not result in a lowering of the quality of the detailing and workmanship of the steel structure. Bracing of forms is relatively simple, but the placing of con-

crete is obstructed by the steel core. This type of construction apparently will cost more than either of the others.

Foundation loading

Piling or soil under a turbine-generator should be conservatively loaded. Suitable provision for distribution of column loads and of any unequal loading should be made, and the mat performing this function should be strong and stiff. Usual construction consists of a thick, reinforced concrete slab, but occasionally the layout will lend itself to a stiff cellular construction.

Columns should be stiff vertically, especially at mid-length of the foundation structure, and consideration should be given to column shortening due to unequal or varying unit stresses and temperature changes. Heat effects must be eliminated throughout the structure as far as possible.

Resonance may be avoided

Avoidance of excessive vibration is a principal design consideration, upon which turbine engineers offer the following suggestions:

The physical properties of completed structures are known to vary so widely that it is useless to try to make too precise calculations of deflections or natural periods of vibrations. The foundation framing is usually so involved that the natural period of vibration of the various members or of the structure as a whole is analytically indeterminate.

However, it is desirable that supports for high-speed machinery should not be resonant, and in the absence of any estimate of natural frequency, the stiffer the structure is the better it is likely to be. One precaution to be kept in mind is that a degree of stiffness that would just correspond to the operating speed to create danger of resonance—a condition that can be incorporated without failing to comply with the other necessary requirements of good design—should be avoided. A speed-amplitude graph indicates, further, that near-resonance (within about 100 rpm.) is serious.

Deflection a measure of vibration

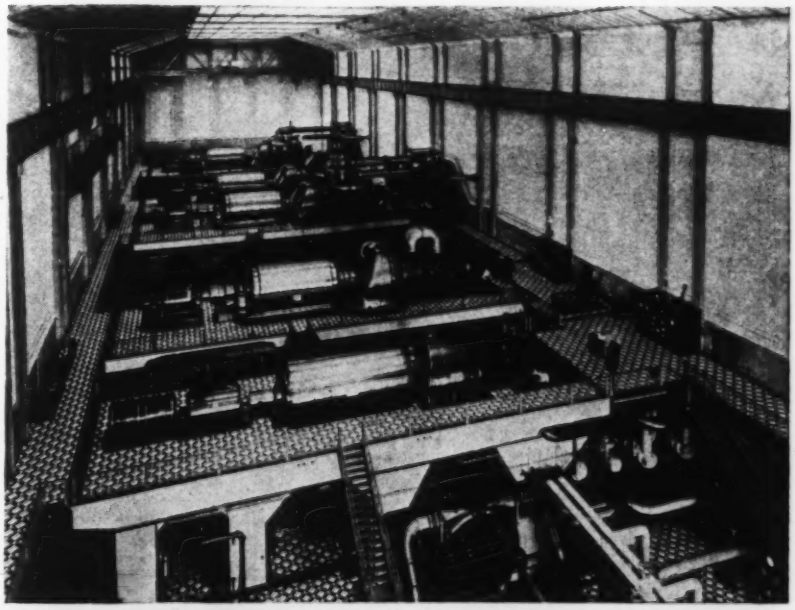
To guard against resonance, it is suggested that under gravity loads the deflection of the main columns plus that of the girders should not be close to the values of deflection corresponding to resonance as given in the following table for simple elastically supported weights:

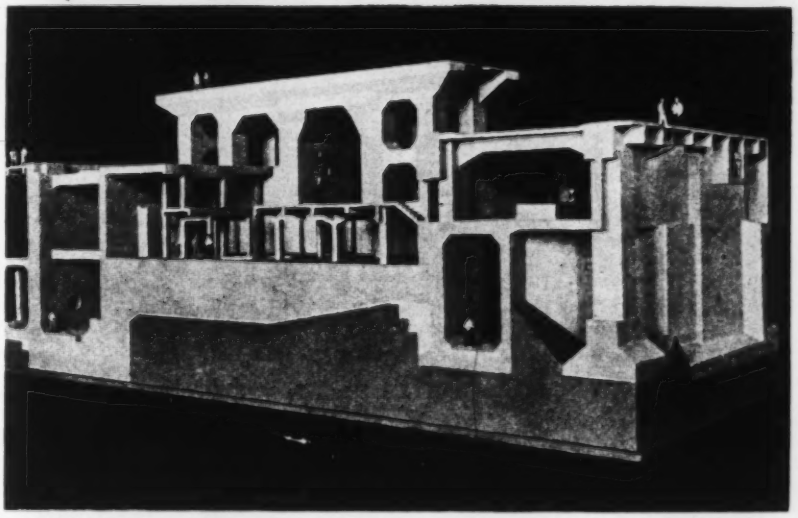
Speed	Resonant Deflections
1,200 rpm.	0.025 in.
1,500	0.015
1,800	0.011
3,000	0.004
3,600	0.0028

In computing such resonant deflections, all actual, rigidly connected gravity loads should be taken into account, including the foundation table, the condenser total weight when in operating condition, the piping and other accessories. On the other hand, the 25 or 50 percent added to the machine loads for conservative design, as well as transitory torque loadings, must be disregarded in computing resonance. Actual weights only should be used.

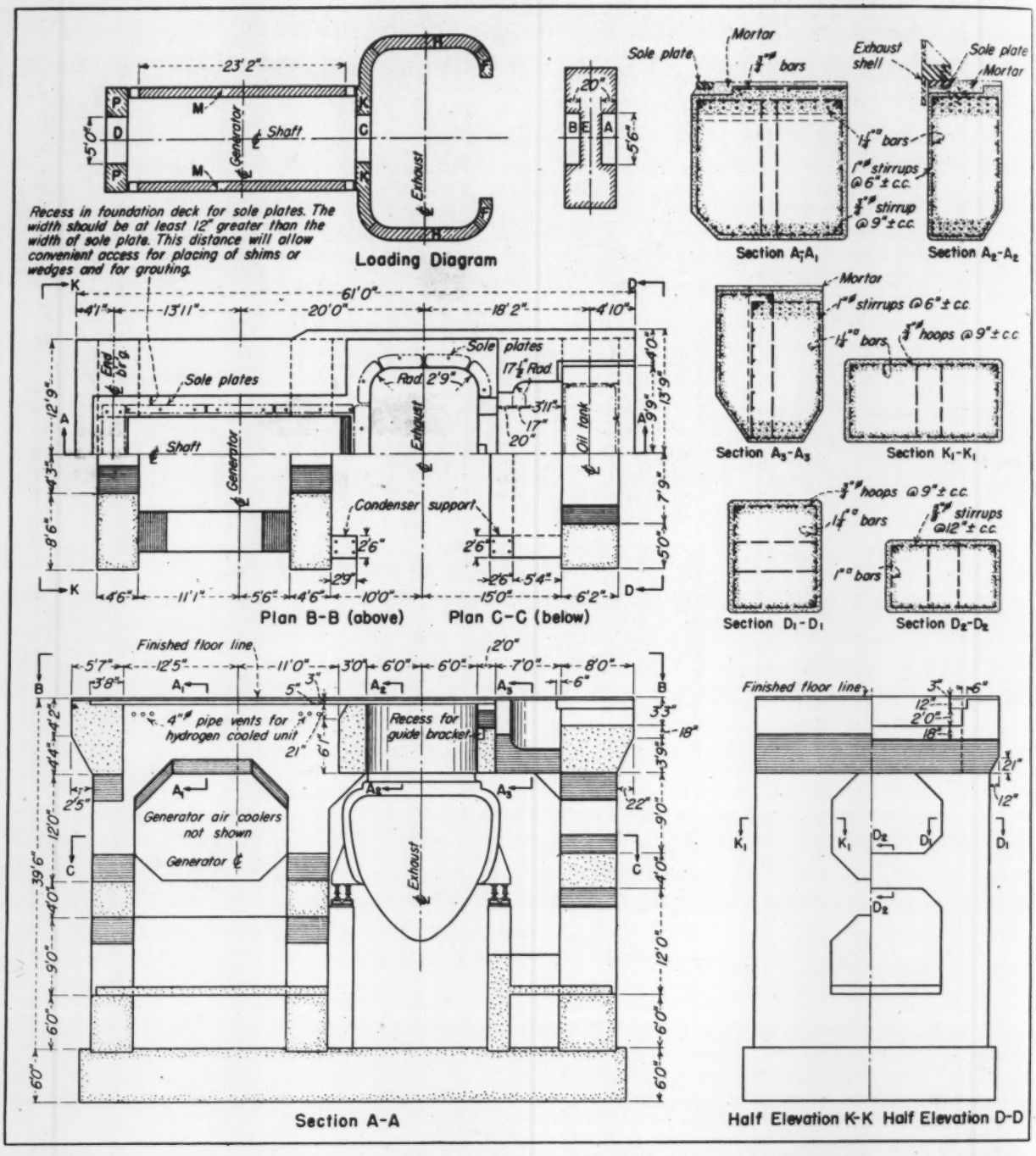
The share of the condenser weight carried on soft springs, which lessens the actual loads on the columns and girders, does not decrease the resonant deflection since the whole weight moves up and down on the main support during vibration. Therefore, the entire rigidly connected weight must be computed.

The old rule-of-thumb for the deflection of turbine-generator foundations (to be used with reservations) was





Foundations of five 50,000-kw. steam turbine-generator sets are isolated from power station floor to prevent transmission of vibrations. Model of one of the reinforced concrete units (below) illustrates its tremendous size and complex framing.



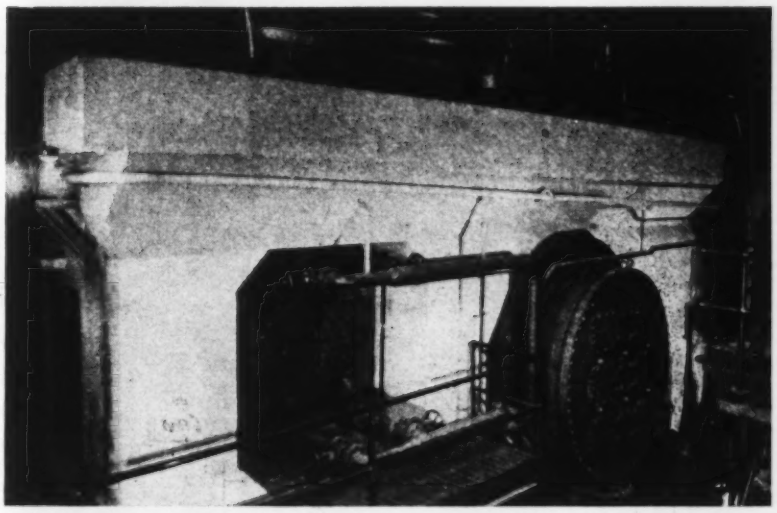
Typical details are shown for reinforced concrete foundation composed of 725 cu. yd. of concrete and 76 tons of reinforcing steel for 80,000-kw., 1,800-rpm., condensing turbine-generator set. Turbine-generator loading in pounds: A, 140,000; B, 130,000; C, 116,000; D, 85,000; E, 88,000; F, 120,000; H, 64,000; K, 30,000; M, 130,000; P, 8,500. To provide for condenser or vacuum loading, percentages of the corresponding previous loads to be added are: to C, 10; to F, 16; to H, 18; and to K, 11.

0.020 in. for each individual member. This rule was intended to provide the maximum stiffness practicable so that the turbine-generator unit could readily be given a satisfactory alignment, but without entering the danger zone for possible resonant vibration.

While this crude rule is by no means universally applicable, reference to the preceding speed-deflection tabulation indicates that it gives a fair margin of safety from resonance for machines with speeds above 1,500 rpm. At and below this speed the margin seems pretty small, especially since the theory is of very uncertain application, considering the complex structures involved, for most beams are filleted or knee-braced, with the result that end conditions are unknown, and sometimes the members are even trans-

formed into arches. In addition, rigid or semi-rigid framing of adjacent beams, bents or columns will have unknown effects. When other doubtful conditions, such as the fact that the modulus of elasticity of concrete varies widely, are taken into account, the use of a somewhat greater deflection in connection with machines in the medium speed range appears to be advisable.

Accurate resonance calculations, though usually difficult, are imperative when flexible foundations are designed. This type of structure is used when space limitations leave no alternative, when machines do not have serious alignment problems or when they are mounted at unusual elevations; for example, as in the case of a mercury turbine set above a boiler.



Auxiliary equipment fits neatly into reinforced concrete foundation for 7,500-kw. condensing unit. Portions of generator and exciter can be seen at upper left, turbine at upper right. Generator surface air-cooler is at lower left and condenser and pump at lower right.

Liberal safety factor used

The magnitude of the loads applied to the foundation by the machines is generally supplied by the manufacturer. To take care of vibration, of load distributions not in accordance with those estimated and of emergency conditions, a marginal factor is generally assumed in stress calculations. This loading is usually taken to be 25 percent of the main unit weights for slow-speed machines and 50 percent for 2-pole machines. In making a decision as to the percentage to adopt consideration should also be given to the unit stresses that are being used. The marginal loading and unit stresses together generally provide a liberal safety factor.

Condenser load varies

The steam condenser load requires special study in that the equipment itself is very heavy and its water load, which varies considerably, also may be very large. When springs are placed beneath the condenser to carry part of its weight, the length of the springs, varying with temperature changes of the condenser, determines how much load the springs carry, the remaining weight hanging from the turbine exhaust flange.

Some loads are by no means obvious. For example, an atmospheric-free exhaust line with an expansion joint on the vacuum side of the valve would provide a kick of 10,000 lb. for a 30-in. line. Similarly, an unbalanced circulating water line might have a thrust of 5,000 or 10,000 lb. applied at a long lever arm. These loads, when excessive and overlooked, may conceivably distort both the turbine and the foundation.

In some installations the arrangement may call for an expansion joint between the turbine and the condenser. Thus the pipe thrusts on the condenser are all detached from the turbine. But in their place a vacuum load is de-

GOOD DESIGN PRACTICES

Regardless of the type of structure, minimizing of resonant vibration is to a considerable degree, a practical matter. Experience indicates that adherence to the following rules results in uniformly satisfactory foundations:

1. Provide a stiff structure, primarily for alignment purposes.

2. Use a type of construction that will facilitate the best possible original and permanent alignment, bearing in mind that the machines are installed with an accuracy of better than 0.001 in. This rule applies to everything from the substructure to the grouting of the machine base.

3. Use a material that has mass and internal damping properties (unless for good reasons). If a "live" material (bare steel) is used, concrete filling is advisable, also a concrete covering for the deck, which should be as thick and self-supporting as practicable. Resonance calculations are especially advisable for all members of such a structure. Scrutinize all structural details. Take all possible precautions against misalignment from temperature variations. Be prepared to encase, damp, or in some way "tune-out" any elements that may vibrate in spite of precautions.

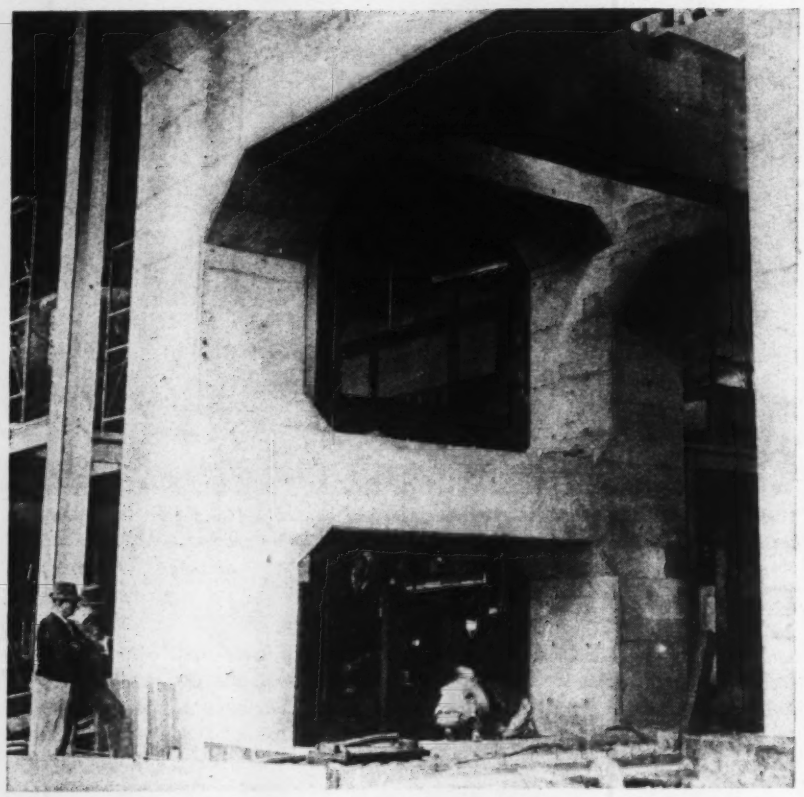
4. Whatever the class of construction, eliminate so far as practicable all brackets, cantilevers, projections. If their use is necessary, make them rigid. They usually result in magnification of vibration amplitude even though not definitely resonant. Make unsymmetrical or eccentrically loaded beams as massive as practicable. Investigate the resonant properties of any floors, and thicken or rib them if necessary.

5. When steel gratings or floor plates are used, mount them on soft rubber cushions or the equivalent. These steel floors are almost invariably lively.

6. Segregate the station operating floor completely at the turbine level. If this is not practicable, break all "moment" continuity between the floor and the foundation.

7. Any metal ducts or similar construction should be viewed with suspicion. Calculate their periods of vibration and be prepared to use additional stiffening if they vibrate excessively. Better yet, segregate them if practicable.

8. On completion of the job make a speed-vibration survey of the assembled installation.



Massive members of the reinforced concrete foundation for an 80,000-kw. condensing unit provide stiffness. Fillets minimize cracks due to stress concentration.

veloped, resulting in a top loading that the foundation must carry; for an exhaust area of 100 sq. ft., this amounts to more than 100 tons.

The torque loading due to the machines is real, and five times the torque is customarily used in stress calculations as an estimate to take care of a possible maximum shock from a short circuit. Torque is assumed to be resisted vertically by the deck framing and the columns.

Horizontal loads assumed

Another arbitrary loading, assigned the duty of providing the structure with transverse strength, is assumed to equal the vertical bearing loads and is applied horizontally at the same point. that is, at the shaft center line. This assumption is considered reasonable for a 2-pole machine, and a smaller value is often used for machines of slower speed. Longitudinal strength is tested by applying the total weight of the rotating element longitudinally at the shaft center line.

To provide the side beams at the turbine-deck level with reasonable strength and to insure freedom from horizontal as well as vertical resonance, an arbitrary side loading, consisting of the weights corresponding to the machine loads carried by these members, has been used to a considerable extent.

The longitudinal anchorage of the turbine-generator unit near its midlength should receive special consideration, and the forward thrust at the steam end due to the expansion of the turbine unit should be taken into account. Another condition to be checked is the anchorage of the guides supplied for the purpose of maintaining the alignment of the shaft—an essential feature, since the turbine slides on sole plates.

Allowable stresses

Although the structure should be designed primarily for deflections, there are some conditions where stress will govern and the loads should be combined to produce maximum stresses. It is perfectly reasonable, therefore, to assume a value of 400 psi. for concrete and 10,000 psi. for steel, because the stresses will not be that high as a rule if deflection requirements are met.

Concrete with a 28-day strength of 3,000 psi. is easy of attainment and if used, may be expected to produce a satisfactory structure. The proportion of steel in the concrete should exceed one percent in columns and 0.5 percent in beams, which are about the minimum that should be tolerated in large members. If the members approach the proportions usual in framed structures, these ratios are generally somewhat low. In turbine-generator foundations, the members are generally massive and might be classed as piers and arches, rather than as columns and beams. Conventional design rules do not necessarily apply.

Recommendations for field work

Some precautions to be borne in mind with regard to construction practices are as follows: Straight reinforcing bars should be used top and bottom, since points of inflection cannot be located accurately, and closed stirrups should be provided to carry shear. In addition to the usual quality requirements, the cement should have low shrinkage properties. Throughout the structure, the same materials should be used.

When there is a choice, the best place to stop a pour is at a point where the restraint caused by the forms might otherwise cause shrinkage cracking, usually at the bases of struts or knee braces.

After the top section is cast, some height will be lost by shrinkage and irregularities. Two or three inches should be allowed so that it will be possible, after the removal of laitance, to have a roughened but perfectly even top surface for the grouting of the machine base. The grout thickness allowance should be uniform throughout and of the amount specified by the machine manufacturer. Before making the final top pour, the center line and anchor bolts should be checked.

When completed and at at the end of a safe waiting period, the structure may be loaded statically to advantage, for this loading helps to stabilize it. It should be left to season and shrink as long as practicable, carefully protected from local sources of heat or uneven drying. The longer the wait the more likely will be the permanence of the initial lineup. Even so, it may be necessary to remove the rotor and correct the alignment after the structure has become thoroughly stabilized.

From Field and Office

WORKING PROBLEMS AND TIME-SAVING METHODS FOR ENGINEERS AND CONTRACTORS

Allowable Stress in Beams

One of the principal changes made in the 1946 revision of the American Institute of Steel Construction "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings" affects the design of laterally unsupported beams. The new specification permits a stress of 20,000 psi. up to a laterally unsupported span for which $ld/bt = 600$, where l is the unsupported length, d the depth of the beam, b the flange width and t the flange thickness. When ld/bt exceeds 600, the permissible stress is given by $12{,}000{,}000\ bt/ld$.

Inspection shows that b, t and d are constants for any particular weight of beam and that each weight of any profile will have a critical unsupported length below which no stress reduction is required. It is also evident that the reduced stress for any span in excess of the critical is equal to 20,000 multiplied by the ratio of the critical span to the unsupported span length. Thus, if the unsupported length is twice the critical length, the allowable stress is ½ of 20,000 or 10,000 psi. This ratio is also applicable to loading tables, as far as the loads are determined by bending.

The accompanying table gives the critical lengths of all ordinary rolled sections included in the revised list of shapes recently approved by the Bureau of Standards, which is expected to be effective after July 1 of the current year. Use of the table is simple. When the unsupported span is less than the critical length, the allowable unit stress (if not otherwise limited) is 20,000. When the laterally unsupported span exceeds the critical length, the stress is found by simple proportion.—TRUMAN P. YOUNG, *Hanly & Young, Structural Engineers, Cincinnati 2, Ohio.*

TABLE OF MAXIMUM LATERALLY UNSUPPORTED SPANS FOR FULL UNIT STRESS
1946 AISC SPECIFICATIONS

Wide Flange Beams			Wide Flange Beams			Wide Flange Beams			Standard I-Beams		
Beam Depth	Beam Wt.	Max. Span	Beam Depth	Beam Wt.	Max. Span	Beam Depth	Beam Wt.	Max. Span	Beam Depth	Beam Wt.	Max. Span
36 WF	300	38.0	16 WF	40	11.0	10 WF	60	33.6	15 I	50.0	11.7
	280	35.7		36	9.4		54	30.6		42.0	11.4
	260	32.8					49	27.9	12 I	50.0	15.1
	245	30.9	14 WF	426	135		45	24.5		40.8	14.4
	230	28.9		398	128		39	21.2		35.0	11.5
	194	20.9		370	122		33	17.6		31.8	11.3
	182	19.5		342	115		29	14.2			
	170	18.2		314	108		25	12.3	10 I	35.0	12.1
	160	17.0		287	100		21	9.8		25.4	11.4
	150	15.7		264	94.1						
				246	89.0	8 WF	67	43.0	8 I	23.0	11.1
33 WF	240	33.1		237	86.2		58	38.0		18.4	10.6
	220	30.4		228	83.8		48	32.6			
	200	27.4		219	80.9		40	27.3	7 I	20.0	10.8
	152	18.3		211	78.4		35	24.4		15.3	10.2
	141	16.6		202	75.7		31	21.6			
	130	14.9		193	72.9		28	18.8	6 I	17.25	10.7
				184	70.1		24	16.3		12.5	9.9
30 WF	210	32.8		176	67.4		20	12.2			
	190	29.7		167	64.4		17	10.0	5 I	14.75	10.7
	172	26.8		158	61.5					10.0	9.8
	132	17.4		150	58.8	6 WF	25	21.7			
	124	16.2		142	55.9		20	17.8	4 I	9.5	10.2
	116	14.8					15.5	13.4		7.7	9.7
	108	13.4		320	104						
				136	53.1	5 WF	18.5	20.6	3 I	7.5	10.8
27 WF	177	30.7		127	50.1		16	18.0		5.7	10.1
	160	27.8		119	47.4						
	145	25.3		111	44.4	Miscellaneous Beams			Channels		
	114	17.2		103	41.6						
	102	15.3		95	38.5	4x4B	13	16.8	18	58.0	7.3
	94	13.9		87	35.6		10	13.2		51.9	7.1
				84	33.0					45.8	6.9
24 WF	160	32.3		78	30.6	12x4B	22	6.9		42.7	6.8
	145	29.2		74	27.8		19	5.7			
	130	26.0		68	25.6		16.5	4.5	15	50.0	8.0
	120	23.1		61	23.1					40.0	7.6
	110	21.3		53	19.0	10x4B	19	7.7		33.9	7.3
	100	19.4		48	17.2		17	6.5			
	94	16.2		43	15.4		15	5.4	12	30.0	6.6
	84	14.5								25.0	6.3
	76	12.8		38	12.3	8x4B	15	7.7		20.7	6.1
				34	10.9		13	6.3			
21 WF	142	33.5		30	9.3				10	30.0	6.6
	127	30.2				6x4B	16	13.0		25.0	6.3
	112	26.7	12 WF	190	76.5		12	9.3		20.0	5.9
	96	20.0		161	67.0					15.3	5.6
	82	17.0		138	57.2	12x4J	14	3.7	9	20.0	6.1
	73	14.4		120	51.9					15.0	5.7
	68	13.4		106	46.8	10x4J	11.5	4.1		13.4	5.6
	62	12.1		99	44.0						
				92	41.2	8x4J	10	5.1	8	18.75	6.2
18 WF	114	31.7		85	38.5					13.75	5.7
	105	29.2		79	35.9	6x4J	8.5	6.5		11.5	5.5
	96	26.9		72	32.9						
	85	22.0		65	30.0	5x5M	18.9	15.6	7	14.75	6.0
	77	20.1		58	26.3					12.25	5.7
	70	18.2		53	23.9	Standard I-Beams				9.8	5.5
	64	16.7		50	21.2				6	13.0	6.2
	60	14.4		45	19.2	24 I	120	18.5		10.5	5.8
	55	13.1		40	17.2		105.9	18.0		8.2	5.5
	50	11.8		36	14.5		100	13.1			
				31	12.5		90.0	12.9	5	9.0	6.0
16 WF	96	30.8		27	10.8		79.9	12.7		6.7	5.6
	88	28.3				20 I	95.0	16.5			
	78	23.0	10 WF	112	57.2		85.0	16.1	4	7.25	6.3
	71	21.0		100	52.0		75.0	12.6		5.4	5.8
	64	19.0		89	47.1		65.4	12.3			
	58	17.2		77	41.7				3	6.0	7.3
	50	13.6		72	39.1	18 I	70.0	12.0		5.0	6.8
	45	12.3		66	36.0		54.7	11.5		4.1	6.4

Fixed Costs Chargeable To Bridge Construction

An analysis of a large number of bridge construction cost records by the Illinois State Highway Department shows that there is a definite relationship between certain fixed costs, the total man-hours of labor, and the average number of workmen. Constants obtained from this analysis can be used to check values calculated in more detail.

Results of this study of construction costs indicate that the following constants apply to the total number of man-hours required for the job:

	Percentage of total man-hours
Moving plant equipment in and out	1.0
Clearing the bridge site	0.5
Job overhead (Preliminary work)	4.0
Cleaning up the job	1.5
Total	7.0

The following constants apply to the

average number of men in the bridge construction gang: (1) Monthly rate (AGC schedule) of total equipment on the job equals $145 times the average number of workmen; and (2) Freight charges on moving the equipment to and from the job equals $34.10 times the average number of workmen.

A fair equipment charge is

$$0.50 \times \frac{\text{Working days}}{20} \times \text{monthly}$$

equipment rate. And an average fuel cost has been found to be 8.0 percent of the equipment charge.

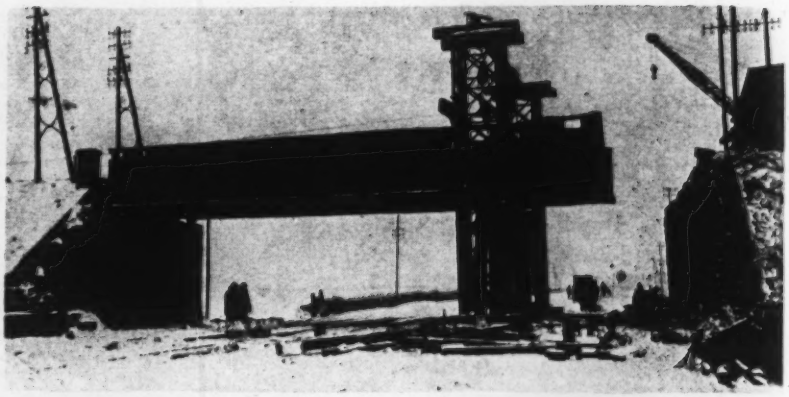
Assume the following for a typical bridge contract:

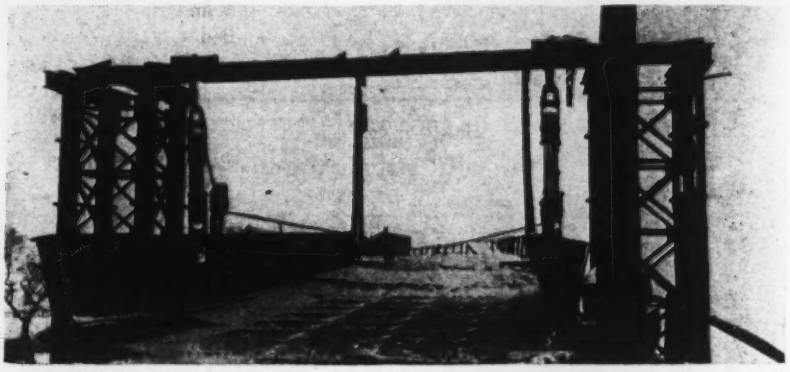
Total cost of job including 12 percent profit	$47,000
Total man-hours of labor	12,509
Average construction crew	13 men
Number of working days, $\frac{12,509}{8 \times 13}$	120
Monthly equipment rate ($145 × 13)	$1,885
General overhead and bond	6 percent of total cost.
Then, the fixed costs are:	
General overhead and bond (0.06 × $47,000)	$2,820
Equipment charge $(0.50 \times \frac{120}{20} \times 1,885)$	$5,655
Moving equipment in and out, clearing site, job overhead and cleaning up (0.7 × 12,509)	$876
Freight charges ($34.10 × 13)	$442
Total fixed costs	$9,793
Fuel charges (0.08 × $5,655)	$452
Total fixed costs plus fuel	$10,245
Profit (0.12 × $10,245)	$1,229
Total	$11,474

Thus, the total fixed costs, plus fuel charge and profit, equal $\left(\frac{\$11,474}{\$47,000}\right)$, or 24.4 percent of the total cost of the job.—W. N. SCHROEDER, *Office Engineer, Bridge Office, Illinois State Highway Department, Springfield, Ill.*

Wrecked Bridge Saved For the French

Usually when a wrecked bridge in France constituted a road block it had to be removed quickly and unceremoneously. This necessary procedure of our Army Engineers was naturally not popular with French officials, who would eventually have the responsibility for rebuilding the structures. Consequently, some of these officials were particularly pleased with a departure from this practice followed on a highway girder span north of Metz, which had blocked some main-line railway tracks when its end had been blown off by German demolition charges.





Lifted from its position blocking the tracks, this damaged span is to be left on this temporary tower provided by U. S. Army Engineers until the French can repair it. The span was lifted by block-and-falls, [lower illustration] motive power being supplied by tractor in background.

Too heavy to break up and pull out of the way quickly, the remaining part of the span was raised as shown in the accompanying illustrations. A tower of light steel trestling was built as a support for eight-part block-and-falls, which were attached to the girders. The hoist lines were carried through snatch blocks to a tractor which provided the lifting power. Once up, the span was supported on brackets attached to the towers, and left in this condition for the French to rebuild at their leisure.

Field and Office Comment

Sighting Rod With Hat

The photo showing a sighting rod held in place by an instrument tripod at the Idlewild Airport, *ENR*, May 16, vol. p. 803, recalls a similar but more complicated use of such equipment years ago when running base line on the sidewalks of New York for the subway from Times Square down Seventh Avenue by the Pennsylvania Station. Perhaps this practice still is followed.

To see over the heads of the crowds it was necessary to plumb the pole with a transit and take foresights or backsights on the top. This was done by setting the transit approximately on line, about 25 feet away and sighting at the bottom of the pole and then at the top, and moving the top until it was on line.

To keep pedestrians from bumping into the tripod, particularly people carrying bags (suit cases in those days) the transit box was placed near one leg and a survey bag at the other. A man would be left on guard. Even with all these precautions accidents would happen. The guard would then take down the pole and put it up again with his hat on top. When the transitman next sighted the top of the pole and saw the hat he knew he must replumb the pole.—CARL H. LOVEJOY *Barrington, Rhode Island*

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

Early Wind-Power Studies

Sir: I note that on page 72 of your Aug. 8 issue, in a news item regarding wind-power turbines, you state in the second paragraph that no full size aero-generators have been constructed; yet in your own publications you have discussed the wind-power turbine near Rutland, Vt., of the Central Vermont Public Service Co.

FRANK H. MASON
Winthrop, Me.

EDITOR'S NOTE—Our news item concerning the wind turbines to be built by the Federal Power Commission would have been clearer if it had stated that no full size aero-generators have been constructed *by the Federal Power Commission* as part of its study of the possibilities of generating electric power from wind, (*ENR* May 31, 1945, vol. p. 752).

As Mr. Mason states, a wind turbine of 1,000 kw. capacity was built in 1941 and installed in the Green Mountains on Grandpa's Knob, near Rutland (*ENR* April 10, 1941, vol. p. 518). The wind turbines proposed to be built by the Federal Power Commission will have a capacity of 6,500 kw.

French Road Progress

Sir: In the article "Impoverished Europe Faces Slow Comeback" (*ENR* Feb. 7, 1946 vol. p. 203) the section entitled "Bridges, Big French Need" contains a certain number of incorrect statements.

First of all, it is stated that the French system includes only about 17 kms. of express highways between Paris and St. Germain. Actually the length of this section is 35 kms. Further than this there has never been any question of constructing in France a system of special highways for automobiles, as in Germany or in Italy. These two latter countries rushed into the construction of speedways in order to make up for their lack of ordinary connecting roads. The problem is not the same for France which possesses the densest system of roads in the world and which needs only to improve that system to the needs of modern traffic. The only speedways planned at present are those now under construction which are intended to facilitate approaches to certain big cities, such as Lyon and Marseille, and the one which, if actually undertaken, will link Paris and Lille.

As for the "old trees" that border their roads, certain it is that Frenchmen are very much attached to these trees, which help to hide from view their fields, at the same time offering protection to the right-of-way. But never once has the Administration of Bridges and Highways hesitated to cut them down when there was need for widening the road.

It is likewise necessary to question the statement that "there is no point in trying to attain a speed, on French roads, above 35 miles an hour." Provided, of course, that they are in normal state of repair, these roads usually allow much greater speeds than that, and, for French motorists, it is not at all rare to attain, and even to go over 60 mph. On this point, the road system of France could favorably stand comparison with that of a good many other countries.

Insofar as the rebuilding of bridges is concerned, it suffices merely to cite the following statistics to prove that such work is progressing less slowly than the author of the article is willing to admit:

Number of bridges destroyed in 1940	2,500
Number of bridges rebuilt between 1940 and 1944	
Permanently	1,050
Temporarily	945
Number of bridges destroyed in 1944 and 1945 (of which 422 had already been rebuilt once on a permanent basis, before 1944; and 556, on a temporary basis)	5,944
Number of bridges rebuilt since 1944	
Permanently	1,184
Temporarily	4,650

This considerable effort was made in spite of all kinds of difficulties which France experienced after liberation and which she experiences even now (scarcity of materials, lack of transportation, etc.). If their public works projects do not always have at their disposal modern equipment, it is because the latter has to a great extent been destroyed, worn out, or deliberately carried off by the Germans.

M. RUMPLER
Director of Roads
French Ministry of Public Works and Transport

EDITOR'S NOTE—Assurance can be extended Monsieur Rumpler that there is no lack of understanding among American engineers of France's substantial success in getting its roads and bridges back into service nor of sympathy and good wishes for that country in her immense task of reconstruction. The article referred to was by no means devoid of appreciation of the great difficulties that France is facing and overcoming. Other articles in *Engineering News-Record*, which have recorded significant and praiseworthy planning and progress, include "France Begins Bridge Reconstruction on Seine and Marne at Paris" Nov. 1, 1945, vol. p. 572; "France Rebuilds Its Rail Bridges" Aug. 8, 1946, vol. p. 178; "French Engineers Build Dam with Spillway Over the Powerhouse" Aug. 8, 1946, vol. p. 182 and an editorial "France Begins Again" Nov. 15, 1945, vol. p. 648.

Plans Should Be Free

Sir: I believe it is a great mistake to require contractors who are bidding on public work to pay the cost of obtaining plans and specifications.

In doing work for a number of municipalities as well as private clients it seems to me that it is advisable not to require a deposit, whether returnable or not, from legitimate contractors bidding on work. The contractor is put to quite an expense in estimating for his bids and I believe it is to the interest of the owners in every case to encourage legitimate bidders as much as possible on each job, thereby providing for free and open competition.

F. E. HARLEY
Harley and Garlick, Engineers
Fair Lawn, N. J.

Book Notes and Reviews

The month's addition to the engineer's reading and reference list

Current Economic Issues

ECONOMICS IN ONE LESSON—By Henry Hazlitt. 222 pp. Harper & Brothers, New York and London. $2.00.

The title of this book gives little information as to its content. Actually it is a case by case analysis of current economic issues such as using public works to "prime the pump" of national prosperity, minimum wage laws and hand work vs. machine work. The author is a member of the editorial staff of *The New York Times.* He writes in an easy style that is as free as possible from technicalities and obtruse theories. His purpose is to look behind the immediate effect of current economic fallacies to trace their effect on the whole nation, not merely the one group mostly directly affected by such proposals as government price fixing and protective tariffs.

Structures Analyzed

THEORY OF STRUCTURES—By S. Timoshenko and D. H. Young. 488 pp., 477 illustrations. McGraw-Hill Book Co., Inc., New York 18 and London. $5.00.

Excellently presented, the "Theory of Structures" should prove good reading for structural engineers as well as a useful textbook. It applies the general principles of mechanics to the solution of practical problems, including determinate and indeterminate trusses, space structures and arches, continuous beams, rigid frames and rings.

General theories relating to elastic systems—strain energy, principle of superposition, virtual displacements, Castigliano's theorem, method of least work, to mention a few—are presented with applications to elementary as well as complicated and indeterminate systems. A chapter is devoted to the theory, determination and use of influence lines. To furnish the student with ample exercise in the solution of problems, a number of unsolved examples are provided.

In the light of present-day engineering-school curriculums, the topics have been well chosen. However, it is probable that practicing structural engineers will regret that more information is not included on skewed frames, domes, cylindrical shells and, other special framing as well as upon the most recent variations of moment distribution analysis for statically indeterminate structures.

Airfield Design Studies

SOILS, CONCRETE AND BITUMINOUS MATERIALS—288 pp. Department of Scientific and Industrial Research, London. Price 10 shillings. Obtainable through G. E. Stechert & Co., 31 East 10 St., New York 3, N. Y.

This publication is a record of a course dealing with airfield construction given at the Road Research Laboratory, Department of Scientific and Industrial Research of the British government, July-August 1943. It covers a wide variety of interesting subjects in connection with airfield design and construction. Although a large portion of the data was obtained from American sources, it presents new ideas on the subject. Two of the most important of these are the application of the unconfined compression test and elastic theory to airfield pavement design, which should be of interest to American engineers. Other pertinent topics covered are wet sand processing for sand asphalt mixes, concrete slabs and waterproofing of soils.

Use of stress-strength method of designing flexible pavement surfaces instead of empirical curves is a major step forward. By this method the shearing strength determined by the unconfined compression test is compared directly with the maximum shearing stress determined by the elastic theory by dividing the maximum vertical pressure on the subgrade by Pi. This is a basically scientific method of design. However, it is conservative since the unconfined compression strength is the minimum shearing strength, and the load divided by Pi is the maximum shearing stress.

The use of the unconfined compression field apparatus is excellent for conditions where subgrade clays are saturated such as those encountered in England. The Krey theory of ultimate failure of a loaded area was also applied in determining the load carrying capacity of pavements and metal tracks.

Soil stabilization by various methods has received a brief but practical treatment. It is of special interest to note that the compilers of this report emphasize plant-mix rather than road-mix procedures—*Reviewed by* T. A. MIDDLEBROOKS, *Principal Engineers, Office of the Chief of Engineers, U. S Army, Washington, D. C.*

Miscellaneous Notes on Booklet and Reprints

TEN YEARS OF EXPERIENCE in interstate control of development and use of the waters of the Delaware River is outlined in a pamphlet entitled "Incodel" published by the Interstate Commission on the Delaware River Basin, Philadelphia, Pa. The commission was set up in 1936.

REDESIGN OF NEWARK AIRPORT to make it adequate for use as one of the major air terminals in the New York metropolitan district is proposed in a report entitled "Development of Newark Airport and Seaport" prepared by the Port of New York Authority for the city of Newark, N. J. The Newark airport was taken over for military purposes during the war but is now being put back into civilian use. Enlargement and reconstruction of Port Newark, which adjourns the airport, also is covered in the Port Authority report.

New Engineering Books

RUDIMENTARY MATHEMATICS FOR ECONOMISTS AND STATISTICIANS—By W. L. Crum and Joseph A. Schumpeter. 183 pp. McGraw-Hill Book Co., New York 18, and London. $2.50.

MANUAL OF DESIGN FOR ARC WELDED STEEL STRUCTURES—By LaMotte Grover. 300 pp. Air Reduction Sales Co., Dept. MD, 60 East 42 St., New York 17. $2.00.

WOMEN CAN BE ENGINEERS—By Alice C. Goff. 227 pp. Privately published by the author, 153 Lauderdale Ave, Youngstown 4, Ohio. $2.50.

(*Continued on p.* 120)

LABOR DAY • 1946
—Time for wise union leadership

LABOR DAY, 1946, finds one hopeful element in the relations between American management and labor which was not there on Labor Day, 1945. It comes in recent expressions by a number of national leaders of organized labor that increased "real" wages depend upon *increased productivity*, i.e. increased output per man-hour. Increased money wages which are promptly offset by higher prices do nobody any good.

If these expressions, *which still remain to be substantiated by practical performance*, come to be accepted by the rank and file of labor in each community, Labor Day, 1946, can usher in a period of great and perhaps unprecedented improvement in the economic wellbeing of wage earners—as well as the wellbeing of the country at large. If, on the contrary, they remain merely window dressing and there is a continuation of the post V-J Day process of increasing wages and then prices, the outcome can only be the bursting of an inflationary bubble, with attendant suffering for workers and the community generally.

Competition requires management to bear down heavily on increased labor productivity as a prelude to wage increases. Management, however, has rarely made a more forthright statement on the importance of increasing labor productivity than that contained in a recent issue of LABOR'S MONTHLY SURVEY, an official publication of the American Federation of Labor.

William Green, the Federation president, led off with a "message to American workers." He remarked, "Our major need is increased volume of production." Observing that "wage increases this spring have been paid for by raising prices," the survey itself goes on to say that "Today America's ability to raise wages without increasing prices and living costs depends on increasing productivity in civilian industries . . . Here is the challenge to free labor and free enterprise today: *Cooperate to increase productivity and raise living standards without strikes.*" (Italics supplied.)

The importance of increasing production was also recently stressed by Walter Reuther, President of the United Automobile Workers, C.I.O., who remarked that his union "is just as eager as management to get the (automobile) industry into maximum production." In taking this general line he was in accord with the position of Philip Murray, head of the C.I.O., who in a book, "Organized Labor and Production" written with Morris L. Cooke, remarks that, "The modern labor leader also realizes that to receive a good day's pay a man must do a good day's work and that *increased productivity has been the vital factor in the country's industrial supremacy and its relatively high wage scale.*" (Italics supplied.)

In citing increased productivity as the key to increased "real" wages these labor leaders—and management—have the historical record entirely on

SPOT CHECK ON LABOR OUTPUT

In the absence of reliable general statistics on what has happened to productivity of labor since V-J Day (because of strikes and reconversion complications) the McGraw-Hill Publishing Company asked the executives of a cross section of American industry to report their own impressions. The questions asked and summaries of the replies, which varied markedly from industry to industry and plant to plant, follow.

Question No. 1. How well have workers performed since V-J Day as compared to their pre-war effort?

Answer. Worker effort has been below pre-war. There are exceptions, particularly among older and more experienced workers; and there are quite a few signs of improvement.

Question No. 2. How much headway have you been able to make since V-J Day in improving labor productivity by better equipment and organization?

Answer. Some headway is generally being made, but it has been greatly retarded by inability to get new equipment and, in some cases, by lack of labor cooperation in improvements in organization.

Question No. 3. How much improvement in equipment and organization is to be anticipated in your business over the next year?

Answer. Marked improvement in productivity (in a few cases as much as 20 per cent) can generally be made if there is sustained production and full cooperation between labor and management.

their side. In the 40 years prior to the outbreak of World War II output per man-hour for the country as a whole was approximately doubled. Over the same period the "real" hourly earnings of industrial workers were also approximately doubled. There were, of course, great variations in the increase of output per man-hour from one line of activity to another. Also, there were periods when increases in "real" wage rates lagged behind increases in productivity. But for the 40 year period as a whole and the economy as a whole there is no mistaking the fact that the route to increased "real" wage rates was increased productivity.

Three economic factors played major roles in this doubling of production per man-hour which has made America the industrial marvel of the modern world. One was the skill and diligence of American workers. A second was the skill and diligence of American management in organizing production. A third was the improvement of machinery and the increased application of power to it.

Wartime Record

During World War II this sustained increase in the productivity of labor in *civilian* manufacturing industries, which had averaged about 3 per cent a year, was brought to an abrupt halt. Much of the most efficient segment of the nation's labor force went to war or war industry. Also, civilian industry was starved for new equipment while we equipped our arsenals. The result was that the productivity of labor in those civilian manufacturing industries for which the government keeps records actually declined throughout most of the war. By 1945 it was no higher than in 1941, whereas, if it had maintained the long run average, it would have been about 12 per cent higher. In the meantime, however, average hourly wages in these civilian industries had increased about 40 per cent.

In *war* industry, which started from low levels of production at strange tasks, there were substantial increases in output per man-hour. Many of these increases involved new processes, improved techniques, and better machines which can be adapted over a period of time to the improvement of productivity of labor in civilian industry.

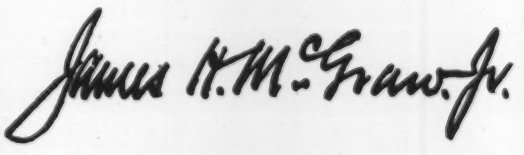
Since V-J Day, however, labor, led on by a misguided government, has had its sights on higher money wages instead of improving productivity which would have laid the foundation for increased "real" wages. Consequently, debilitating industrial strife ended in a round of wage increases which, in the absence of increased productivity, is being washed out by higher prices.

To Keep Production Rolling

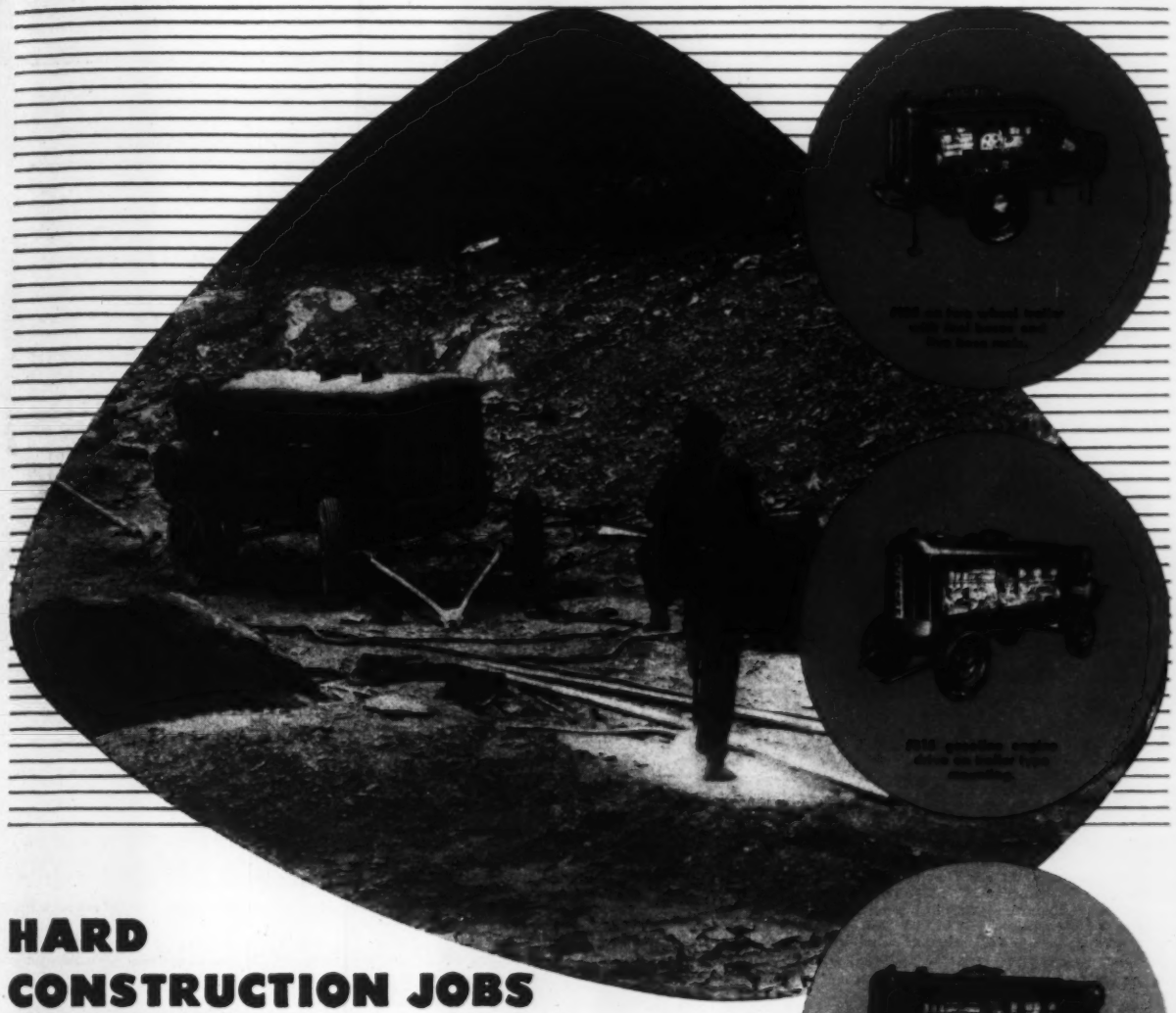
However, as indicated by the summary of a McGraw-Hill sampling of the current experience of industry in increasing output per man-hour, which appears in the center of the page, there is hope that the situation ahead can be improved. After agonizing delays because of work stoppages, material shortages, and reconversion complications, industrial production is beginning to roll again. Allowed to roll it will not be long before it will be making those advances in productivity which are the only true basis for increased "real" wages.

If the process of keeping American industry rolling to new highs of productivity is to be resumed, management must see that the past practice of translating increased output per man-hour into increased "real" wages is not only sustained but wherever possible accelerated. For its part organized labor must abandon its manifold feather bedding rules and other production-restricting practices which afflict considerable segments of American industry. Further it must give incentive systems of pay, honestly conceived and honestly administered, a fair break. *Management and labor and government and the community at large must collaborate in removing that specter of working one's self out of a job which has been one of the greatest causes of restriction of output.*

The current emphasis by leaders of organized labor on the economic truth that increased output per man-hour is the only road to increased "real" wages is important. The next step is to see that recognition of this truth seeps into the rank and file of labor and industry and becomes the basis of a program of action at the local level. If it does, and quickly, Labor Day, 1946, may mark a tremendous turning point toward sustained prosperity not only for labor but the community at large. If it does not, union leadership will fail in its responsibility and must answer to the American people for the consequences of such a failure.



President McGraw-Hill Publishing Company, Inc.



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MATERIALS AND LABOR PRICES

Market quotations on construction materials and wage rates reported monthly by ENR correspondents

In September, CEMENT again showed widespread increases. Price increases, ranging from $.04 to $.98 per bbl. were felt in Boston, Chicago, Cleveland, Detroit, Los Angeles, Minneapolis, New York and St. Louis. Common BRICK rose $.10 per M in New York, $.50 in Seattle, $.75 in Detroit, $2.50 in Denver, and $3.25 in Philadelphia. The price of DOUGLAS FIR rose $1.25 per M ft. B.M. in Boston, $5.50 in Los Angeles and $1.50 in Minneapolis. SOUTHERN PINE increased $4.50 in Atlanta, but dropped $39.50 in St. Louis due to the return of the OPA.

VITRIFIED SEWER PIPE also showed price increases in New York, St. Louis, and Birmingham. Prices in Seattle were irregular, rising for ready-mixed concrete, concrete block, and concrete sewer pipe, but dropping on cutback asphalt and road oils. COMMON LABOR wages remained fairly constant. The greatest gains for the SKILLED LABOR trades were reflected in the following increases for structural ironworkers: $.07 an hour in Chicago, $.20 in Denver, $.175 in Detroit, and $.25 in Pittsburgh. CARPENTERS wages rose $.10 in Baltimore, $.075 in Denver and Detroit, and $.125 in Pittsburgh.

CEMENT, AGGREGATE, READY-MIXED CONCRETE—F. O. B. CITY

	PORTLAND CEMENT — Per bbl. C/L lots incl. 40c per bbl. for bags, cash dis. not deducted			SAND AND GRAVEL — Per ton, carload lots			CRUSHED STONE — Per ton, carload lots		CRUSHED SLAG — Per ton, carload lots, f.o.b. plant		CONCRETE BLOCK — 8x8x16-in.; truckload del.; per block		READY MIXED CONCRETE — 1:2:4, over 6 sack, 3000 lb., 28-day, 6-in. slump, 10-yd. min. del.
	Cloth	Paper	Bulk	Gravel 1½ in	Gravel ¾ in.	Sand	1½ in	¾ in	1½ in.	¾ in.	Sand-grav	Lt.wgt.Agg.	50 c.y., del
Atlanta	$2.77	$2.52	$2.43	$1.79	$1.89	$1.65	$1.79	$1.89	$1.59	$1.69	$0.17	....	$9.00
Baltimore	2.70a	2.45a	2.20a	2.05‡	2.05‡	1.55‡	2.00‡	2.00‡	2.00‡	2.00‡	.145	$0.145w	8.00
Birmingham	2.70	2.45	....	2.00	2.00	1.80	2.50	2.50	.90	1.15	.1425	....	6.90
Boston	3.70bgg	2.85b	2.60	1.50‡	1.50‡	1.40‡	1.25	1.35	....	....	.13	.155w	7.90m
Chicago	3.56	2.71	2.52	2.23‡d	2.23‡d	2.23‡d	2.15‡d	2.15‡d	1.75‡	1.75‡	.195	.195x	....
Cincinnati	2.59	2.34	2.14	1.20	1.20	1.10	1.80	1.80	....	....	.15	.18w	7.45
Cleveland	3.28	2.43	2.18	1.75i	1.75i	1.40/2.05i	1.95i	1.95i	1.30	1.30	.14	.14	8.75
Dallas	2.51	2.26	2.06	1.80	1.80	1.45	1.72	1.82	....	....	.0875p	....	8.20
Denver	3.59	2.92	2.47	1.20	1.25	.90	1.65	1.75	1.00	1.00	....	.1625w	8.75
Detroit	3.23	2.38	2.18	2.65	2.65	2.35	2.25	2.25	2.00‡	2.00‡	.16	.17w	7.69
Kansas City	2.80	2.60	....	2.00	....	1.40	2.00	2.00	....	....	.16	.16wy	8.50n
Los Angeles	3.30r	2.70r	....	1.44	1.44	1.33	1.44f	1.44f	1.44f	1.44f	.10bb	.125bb	8.72m
Minneapolis	3.50dd‡	3.25dd‡	....	1.00h	1.00h	.25h	1.00h	1.00h	....	....	.183ff	....	7.60j
Montreal	....	1.95r	1.79r	1.65‡s	1.65‡s	1.50t	.80ct	.90ct	....	....	.1924	....	7.00ks
New Orleans	2.41	2.16	1.92	1.67	1.65	1.21	....	....	.90	1.15	.23	....	9.25
New York	4.06‡hh	3.06‡	....	1.74deu	1.74deu	1.07eee	1.80de	1.80de	....	....	.22	.18wcc	8.57kq
Philadelphia	2.75	2.50‡	2.30‡	1.55‡	1.65‡	1.20‡	1.90‡	1.95‡	1.10	1.10	.155	.155w	8.55
Pittsburgh	2.80	2.55	2.35	1.85‡	1.85‡	2.15‡	2.35‡	2.35‡	1.80	1.80	.21s	.21z	9.15
St. Louis	3.12o	2.89o	....	1.81‡o	1.81‡o	1.71/1.81‡o	1.25/1.95	1.25/1.95	.90g	1.15j	.155	.20yo	8.70
San Francisco	2.81	2.21	1.91	1.36	1.36	1.36	1.46	....	....	....	....	.23y	7.55
Seattle	....	2.75o	....	2.35d‡	2.35d‡	2.35d‡	2.35‡od	2.35‡od	....	....	.165	....	8.25

‡ Delivered. a 10c. allowed for each returnable bag. b 10c. per bbl. off for cash. c F.o.b. quarry. d. Per cu. yd. e Barge lots alongside docks. f Crushed granite. g F.o.b. Granite City, Ill. h F.o.b. plant. i Within three miles of Public Square. j 5% discount for cash. k Discount of 2 percent for cash in 10 days. l 2000 lb. concrete. m 50c. off for cash. n 25 c.y. or more. o 2% off for cash. p 5½ x 8 x 12 in. q 5 cu. yds. or more. r 20c. per bbl. off cash 20 days. s 8% sales tax included. t 8% sales tax not included. u In outlying New York districts, price is $1.80. v 20c. per bbl. discount; 80c per bbl. for bags. w Cinder. x Waylite. y Haydite. z Celocrete. aa Pumice. bb 6 x 8 x 12 in. cc Also 8 x 18 in. dd Prices quoted are LCL. Carload lots not available. ee In outlying New York districts, price is $1.22 ff 8 x 8 x 18 in. gg $1.00 per bbl. refund for return of bags. hh Refund of $.25 per bag returned.

CASH DISCOUNTS CEMENT to Contractors: truck delivery, 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount 10c. per bbl. for payment within 15 days of date of invoice. Subject discount 10c. per bbl. 20 days in Montreal

CURRENT MAXIMUM PRICE BASES AT CEMENT MILL

Charge for bags not included. For cloth bags, add 40c. per bbl.; 10c. refund allowed for each returnable bag; for paper bags add 15c. per bbl., not refundable.

	Bagged	Bulk		Bagged	Bulk		Bagged	Bulk
Buffington, Ind.	$1.95	$1.85	Ironton, Ohio	$1.80*	$1.75*	Universal, Pa.	$1.90	$1.90
Hannibal, Mo.	1.95	1.85	Northampton, Pa	1.80	1.70	Waco, Tex. (Plus 9c. tax in Tex.)	1.80	1.80
Independence, Kans.	1.95	1.85	Richard City, Tenn.	2.05	1.95	Montreal City (Discount 10c. per bbl. 20 days)	1.68	1.67
*Destination price base effective Sept. 17, 1945			Steelton, Minn	2.05	1.95			

PAVING BRICK, BLOCK, ASPHALT, ROAD OILS—F. O. B. CITY

	PAVING BRICK AND BLOCK — Granite per M lots of 50,000 4x4x8 in	Brick per M 3x4x8½ in. carload lots	Wood per sq. yd. 3½ in. 16-lb. treat	PAVING ASPHALT — Per ton, less than 80 penetration: Tank car	Drums	ASPHALT BINDERS—FLUXES — Per gal., 80-300 penetration: Tank car	Drums	CUTBACK ASPHALT — Per ton: Tank car	Drums	ROAD OIL — Per gal: Tank car	ASPHALT EMULSION (Quick-breaking) Per gal: Tank car	Drums
Atlanta	$73.00	$35.00	$2.25	$14.00	.....	$0.074	.....	$0.0806h	.....	$0.0781	$0.0806	.....
Baltimore	150.00‡	52.70	85.00m	15.00r	21.00r	.06r	0.09r	13.00r	23.00r	.06r	.07r	.14r
Birmingham	.....	32.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Boston	85.00	59.00	3.75	16.00	25.00	.0675	.12	18.00	31.00	.0675	.0875	.15
Chicago	150.00‡	65.00/68.00e‡	2.85/4.00d	15.00/16.00	23.50	14.15/15.00g	22.65j	.0625/.0675h	.155/.16h	.05/.0575	.09/.10‡	.13/.15‡
Cincinnati	125.00	66.90	.....	17.00	.....	.085	.....	19.20	.....	.07	.085	.....
Cleveland	127.50	39.00	3.87	17.00	19.00	.085	.085	.10h	.11	.08	.....	.....
Dallas	.....	40.00	.....	15.36	22.70	.0618	.12	17.95	28.00	.06	.0725	.135
Denver	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit	.....	75.00t	.....	17.60f	26.56f	.0734	.128	.0718h	.1194h	.067	.0974	.135
Kansas City	.....	45.00	.....	15.00u	20.60u	16.60g	.....	.07h	.0675hu	.....	.11	.15u
Los Angeles	.....	50.00	.....	9.00b	23.00b	9.50bg	24.00bg	9.50bg	.....	.03b	.08b	.16b
Minneapolis	.....	.....	2.017d	.....	.....	.....	.....	.....	.....	.....	.....	.....
Montreal	70.00	.....	.....	16.60k	24.25k	.1035k	.111k	.115hk	.135hk	.06k	.135k	.188k
New Orleans	.....	.....	.....	13.00a	.....s	12.00g	.....s	5.75	.....s	.05	.....	.....
New York	.....	.....	2.70	18.64	28.49p	.0735r	29 44g	.0751h	.1256h	.0678	.0768	.1278
Philadelphia	150.00	62.00	4.06	16.00	.....	15.00	.....	.0675h	.....	.....	14.00gr	.....
Pittsburgh	135.00	39.75	3.90	19.00	25.00	.095	.17	21.00	32.00	.075	.085	.14
St. Louis	.....	42.00	.....	14.80	19.80	13.80g	18.80g	.0587h	.1362h	.483	.07	.1215
San Francisco	.....	47.75c	.....	11.75	21.00	11.75g	.....	13.75	.....	.....	.0525	.1125
Seattle	.....	.....	.....	11.75t	22.75t	9.50	.....	11.75t	14.75	10.90t	.0525t	.0625t

‡ Delivered. a F.o.b. Baton Rouge. b F.o.b. Refinery. c 2½ x 8½ x 4 in. d 2-in. interior block, 6-lb. treatment. e 3½ x 4 x 8½. f Mexican. g Per ton. h Per gallon. i F.o.b. Martines. j 3 x 3½ x 8½ in. k Tax included. l Quoted on request only. m Per thousand. r February 1943 prices, none later available. s Drums not available. t Very scarce. Truck deliveries in small quantities.

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT SHAPES-PLATE	REINF. BARS ¼-in. billet *b*	RIVETS ½-in. structural	WIRE NAILS Base	SHEET PILING Base	STEEL RAILS Per Net Ton Standard	Light	Re-rolled	TRACK SUPPLIES Angle Bars	Std Spikes *c*	Tie Plates *c*	Track Bolts
Birmingham	$2.35	$2.35	$3.75	$3.25	....	$43.39	$49.18	$48.29	$2.70	$3.65	$2.55	$4.75
Chicago	2.35	2.35	3.75	3.25	$2.65	43.39	49.18	48.29	2.85	3.65	2.55	4.75
Pittsburgh	2.35	2.35	3.75	3.25	2.65	43.39	49.18	48.29	2.85	3.65	2.55	4.75
Buffalo	2.35	2.35	....	....	2.65	.....	.....	.....	....	....	2.55	....
Cleveland	....	2.35	3.75	3.25	....	.....	.....	.....	....	....	....	....
Youngstown	....	2.35	....	....	....	.....	.....	.....	....	3.65	....	....
Detroit	....	2.45‡	....	....	....	.....	.....	.....	....	....	....	....
Gulf ports	2.60*a*	2.70*a*	....	....	2.85*a*	.....	.....	.....	....	....	....	....
Pacific ports	3.00*a*	2.75*a*	....	3.75*a*	3.20*a*	.....	.....	.....	....	3.90	2.70	....

‡ Delivered. *a* F.o.b. cars dock. *b* Rail steel same as billet prices. *c* Other basing points include Portsmouth, O., Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., and Pacific coast ports, on tie plates alone. Steelton, Pa., on spikes alone, Lebanon, Pa., Richmond, Va. *d* Add switching charge $18 per el.

IRON AND STEEL PRODUCTS—F. O. B. WAREHOUSE, PER 100 LBS., BASE PRICE

	STRUCTURAL SHAPES Per 100 lb base price	REINFORCING BARS *g* Per 100 lb., ¾ in., base price 15 tons or over *b* New billet	Rail steel	Add Switch	$/cwt. for Del	EXPANDED METAL LATH Per 100 sq. yd., carload lots Std. diamond mesh, 3.4 lb	Std. ribbed 3.4 lb.	WELDED FABRIC REINFORCING Per 100 sq. ft., carload lots 4x16 in., No 5 & 10 wires	4x12 in., No. 8 & 12 wires	6x6 in. No. 6 & 6 wires Per 100 s. f.	SHEET PILING Per 100 lb. base price
Atlanta	$4.05‡	$4.12‡	$4.12‡	$.025	$.10	$23.16	$25.80	$1.95	$1.45	$2.05	$3.35
Baltimore	3.909	3.344	....	....	.10	24.50	26.50	1.83	1.37	1.98	3.25
Birmingham	....	....	....	....	.10	19.00	21.00	1.93	1.44	2.03	....
Boston	4.162‡	4.194‡	2.97*c*	$20 C.L.	.10	18.50	20.50	1.89	1.41	1.98	3.02
Chicago	2.35*a*	2.35*a*	2.35*a*	.03	.05	22.50‡	24.50	1.80	1.35	1.89	2.95
Cincinnati	3.983	2.90*cd*	2.90*cd*	....	.10	....*n*	....*n*	1.86	1.35	1.89	....
Cleveland	3.838	4.00	3.98	.025	.10	20.50	24.50	1.79	1.35	1.88	....
Dallas	5.25	4.17	4.17	....	....	25.50	27.50	2.06	1.52	2.17	....
Denver	4.89	5.02	....	....	....	35.00	35.00	2.10	1.55	2.21	....
Detroit	3.952‡	3.14‡	3.14‡	....	.10	38.00‡	41.00‡	1.81	1.36	1.90	2.95
Kansas City	4.44	2.75*cd*	2.75*cd*	.0	.05	29.50	31.50	1.91	1.43	2.01	3.06*d*
Los Angeles	4.45*f*	3.025	2.875	.03	.05	28.00	27.50	2.06	1.52	2.17	4.45
Minneapolis	4.142‡	2.99	2.99	.0	.10	25.00	27.00	1.93	1.44	2.03	3.06*d*
Montreal	3.95*i*	3.10*i*	3.00*i*	....	....	31.00*hi*	46.00*hi*	2.89	3.54*i*	2.95*im*	....
New Orleans	4.408‡	3.84	4.108	.05	.10	22.00	24.00	1.95	1.45	2.05	3.125
New York	4.008	2.96*c*	2.96*c*	....	.15	17.50	19.50	1.85	1.39	1.95	2.74
Philadelphia	3.937	3.899	....	....	....	20.50‡	22.50‡	1.84	1.38	1.93	2.97
Pittsburgh	2.35*a*	2.35*a*	2.35*a*	.025	.10	23.00	26.50	1.72	1.30	1.81	2.65
St Louis	3.401	2.96	2.96	.0	.05	28.00	34.00	1.82	1.37	1.92	....
San Francisco	4.40	3.025	2.875	.025	.10	28.00	31.50	2.06	1.52	2.17	3.30
Seattle	3.00*e*	3.00*e*	....	....	....	43.50	44.00	2.06	1.52	2.17	3.20*e*

‡ Delivered. *a* Mill prices. *b* 5–15 tons, add 15c. 1–5 tons, add 25c. *c* Less than 1 ton, add 50c. *c* 20 tons or over Base. *d* Mill price plus freight. *e* F.o.b. dock. *f* Includes delivery in free delivery zone. *g* High scrap steel prices cut former 15c. differences between new billet and rail steel in many mills. *h* List prices Plus Dominion and Province sales tax. *m* Per sq. yd. *n* Practically no carloads are available. Retail price delivered is $27.00 for std. diamond mesh and $29.00 for std. ribbed.

PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

	C. I. PIPE Per net ton f.o.b. 6 in. to 24 in.*i*	VITRIFIED SEWER PIPE Per foot, std. 8 in. s.s.	Delivered std. 12 in s.s.	ASTM 24 in.	C13–35 36 in	CLAY DRAIN TILE Per 1,000 ft., carload lots, f.o.b 6 in	8 in.	CONCRETE SEWER PIPE Per ft., delivered: ASTM 12 in.	C 14–35 24 in	WROUGHT STEEL PIPE Full standard weight *h* 1 to 3 in., Butt Weld Black %	Galv %	3½ to 6 in., Lap Weld Black %	Galv. %
Atlanta	$65.66	$0.43	$0.67	$3.39	....	$110.00	$148.00	$0.45	$2.00	65.5	54.5	63.5	52.0
Baltimore	70.20	.35	.60	2.70	$7.25	160.00	200.00	.85	2.25	65.5	57.5	63.0	54.5
Birmingham	61.00	.35	.63	2.736	....	100.00	220.00	.57	1.80	....	....	....	....
Boston	72.80	.392*r*	.756*r*	3.15*r*	7.995*r*	170.00‡*r*	265.00‡*r*	.53	2.04	....	....	....	....
Chicago	70.33	.44	.85	3.37	7.00	110.00‡	150.00‡	.45	1.85*s*	63.0	52.0	61.5	50.0
Cincinnati	69.27	.327	.6345	3.735	10.04	98.70	151.60	.36	1.60	51.5	39.4	51.4	36.0
Cleveland	70.75	.226*r*	.513	2.15	5.535	138.50	216.60	.36	1.60	68.5	57.5	66.0	54.5
Dallas	72.43	.365	.657	2.664	6.60	108.00	130.00	.45	1.75	65.5	54.5	63.0	51.5
Denver	77.56	.36	.648	2.70	....	154.00‡	264.00‡	.52	2.00	44.0*s*	30.25*s*	40.5*r*	25.99*r*
Detroit	70.75	.455	8.775	3.375	8.50	170.00‡*r*	263.00‡*r*	.49	1.75	54.1	40.3	50.9	36.5
Kansas City	71.73	.345	.625	2.47	6.85	173.00	312.00	.45	1.60	60.5	49.5	57.8	46.3
Los Angeles	84.40	.36†	.648†	2.988	7.47	130.50	217.50	1.25	2.50	....	....	....	....
Minneapolis	73.83	.36†*x*	.75†*x*	2.645†*x*	....	.....	.....	.90	2.40	60.6	49.6	57.9	46.4
Montreal	74.20	.85*o*	1.50*o*	5.25*p*	8.50*ep*	45.00*m*	64.00*m*	.811*m*	2.51*m*	....	....	....	....
New Orleans	67.78	.31	.558	3.558	....	112.00	.....	....	....	58.8	47.8	56.3	44.8
New York	69.60	.52	.96	3.82	9.18	.....	.....	.60	1.40	65.5	54.5	69.0	51.5
Philadelphia	68.10	.40	.7735	3.20	8.50	200.00	275.00	.80	2.15	52.75	39.01	49.63	35.25
Pittsburgh	71.18	.322†*r*	.631†*r*	2.70†*r*	6.625*r*	124.20	193.80	.99*r*	2.25*q*	65.5*s*	54.5*s*	63.0*s*	51.5*s*
St. Louis	68.84	.351*w*	.632*w*	2.527*w*	5.60*w*	.....	.....	1.00*f*	2.15*k*	64.5*s*	53.5*s*	63.0*r*	51.5*r*
San Francisco	84.40	.3875*d*	.6975*d*	2.79	6.975	124.50	207.50	.58	2.34	....	....	....	....
Seattle	86.20	.4125	.77	2.98	....	.....	.....	.56*f*	1.60*f*	....	....	....	....

‡ Delivered. † F.o.b. *a* B. & S. class B and heavier, C/L lots, Burlington, N. J. (base) $59.00. Based on existing freight rates; subject to rate change. Gas pipe and class A, $3 per ton additional. 4 in., $5 per ton additional, 30 in. and larger usually $1 per ton less. *b* Double strength. *d* List. *e* 30-inch. *f* Less 5% for cash. *g* Culvert pipe. *h* Discounts from standard list consumers carload prices, except Pittsburgh prices are f.o.b. mill. Base price $200 per net ton. List prices per ft.: ¾ in., 8½c.; ¾ in., 11½c. 1 in., 17c.; 2 in. 37c.; 2½ in., 58½c.; 3 in., 76½c.; 4 in., $1.09; 6 in., $1.92; 3 per cent tax on transportation costs not included. *i* Applies also at Lorain, Ohio, mills. Chicago delivered base is 2½ points less on butt, 1½ on lap. Freight is figured from Pittsburgh, Lorain, O., Chicago Dist. Billing is from point producing lowest price at destination. WROUGHT IRON PIPE: Base price and list prices per ft same as wrought steel pipe. Discount for Pittsburgh base. Butt-weld—1 in. and 1¼ in. black 34 galv. 16; 1½ in. black 38 galv. 18½; 2 in. black 37½, galv. 18. Lapweld—2½ in. to 3½ in. black 31½ galv. 14½; 4½ in. to 8 in. black, 32½ galv. 17. *j* Reinforced; spec. C 76–37. *k* Reinforced; spec. C 75–37. *m* Centri spun. *o* Less 50%. *p* Less 53%. *r* Truck delivery. *s* Gary base. *t* Morain base. *w* Less 3% for cash. *x* Price previously quoted was for carload lots. Since carload lots are not available at this time, listed price is based on LCL (no minimum).

LUMBER, TIMBER, PLYWOOD—PER M FT., B.M., CARLOAD LOTS F.O.B.

	SHORT LEAF YELLOW PINE AND DOUGLAS FIR — All S. L. Y. P. a No. 2 common or better and for No. 1 N C Box. (Prices in Bold Face)						LONG LEAF Y. P Merchantable grade up to 20 ft.			PLYWOOD Rail freight increment (See note for base price)	
	All Fir planks No 2 common, Fir timber is No. 1 common					*Lengths up to 20 ft*	*(Prices in italics)*				
	1x6 S4S	1x8 S4S	2x4 S4S	2x6 S4S	2x8 S4S	2x10 S4S	3x12 R4A	6x12 R4A	12x12 R4A	2x12 R4A	12x12 R4A	⅜"	¾"
Atlanta	$48.25	$48.25	$46.75	$46.25	$47.25	$49.75	.....	.....	.....	$71.00	$71.00	$17.72	$21.37
	62.50	*62.50*	*61.00*	*61.00*	*60.00*	*60.00*	*$54.00*	*$53.50*	*$52.50*	.....	.....	.....	.....
Baltimore	72.50	74.00	69.50	69.00	69.00	75.00	85.00	.....	.....	181.00	175.00	18.45	21.995
	79.00	*80.00*	*78.50*	*78.00*	*77.00*	*78.00*	*92.00*	*95.00*	*85.00*	.....	.....	.....	.....
Birmingham	50.00	50.00	49.50	48.50	49.50	52.50	73.00	.....	.....	72.50	75.00	17.245	20.795
	55.00	*55.00*	*54.50*	*53.50*	*54.50*	*57.50*	*77.00*	*60.00*	*61.00*	.....	.....	.....	.....
Boston	70.00[b]	72.00[b]	66.50[b]	62.50[b]	70.50[b]	74.50[b]	70.25[b]	.....	.....	.....	.....	18.195	21.995
	64.75	*64.75*	*62.75*	*63.25*	*62.75*	*62.75*	*60.50*	*59.50*	*59.50*	*59.50*	.....	.....	.....
Chicago ‡	65.00	66.00	62.00	62.00	62.00	69.00	75.00	.....	.....	97.00	97.00	14.555	17.555
	65.50	*65.50*	*65.50*	*65.50*	*65.50*	*66.50*	*67.50*	*63.00*	*64.00*	...	.....	.....	.....
Cincinnati	51.00	52.50	46.00	46.00	48.00	56.00	70.50	.....	.....	68.50	68.50	17.245	20.795
Cleveland	58.50	58.50	56.50	55.50	56.25	58.25	65.00	.....	.....	.....	91.75	17.615	21.265
	64.50	*64.50*	*58.50*	*54.50*	*54.50*	*55.75*	*63.75*	*58.75*	*57.75*	.....	.....	.....	.....
Dallas	54.50	54.50	52.75	51.75[g]	52.25	54.00	56.50	59.50	59.50	89.75	86.00	14.555	17.555
Denver	77.00[k]	77.00[k]	76.00[k]	76.00[k]	75.00[k]	76.00[k]	76.50[k]	76.00[k]	74.75[k]	.....	.....	10.285	12.435
Detroit	82.00	82.00	79.00	79.00	79.00	85.00	92.00	.....	.....	91.00	105.00	17.245	20.795
	.....[j]	.....[j]	.....[j]	.....[j]	.....[j]	.....[j]	.....[j]	.....[j]	.....[j]	.....	.....	.....	.....
Kansas City a	76.00	76.00	74.00	72.75	73.25	76.00	95.00	.....	.....	95.00	100.00	12.605	15.205
	78.00	*78.00*	*77.50*	*77.50*	*75.50*	*77.00*	*75.00*	*95.00*	*95.00*	.....	.....	.....	.....
Los Angeles a	*74.00*	*74.00*	*74.00*	*74.00*	*74.00*	*74.00*	*80.00*	*79.50*	*79.00*	.....	.....	9.81[gh]	11.86[gh]
Minneapolis ‡b	84.00[e]	82.50[e]	.....	.....	.....	.....	.....	.....	.....	.....	.....	13.765	16.615
‡	*85.00*	*85.00*	*79.75*	*80.00*	*78.75*	*80.25*	*74.50*	*76.25*	*76.75*	.....	.....	.....	.....
Montreal c	69.00	70.00	64.00	68.00	70.00	75.00	.....	.....	.....	.20[i]	.20[i]	.....	.....
	97.00	*97.00*	*97.00*	*97.00*	*97.00*	*97.00*	*87.00*	*87.00*	*87.00*	.....	.....	.....	.....
New Orleans	42.00	42.00	39.00	38.50	34.00	42.00	46.00	.....	.....	54.50	69.00	14.555	17.555
	36.00	*36.00*	*34.50*	*34.50*	*33.50*	*33.50*	*33.00*	*29.50*	*29.50*	.....	.....	.....	.....
New York ‡	Range from $85.00 to $95.00						$95 to $100	.....	.....	125.00[f]	130.00[f]	18.195	21.995
‡	*Range from $91 to $121*									.....	.....	.....	.....
Philadelphia	85.00	85.00	85.00	85.00	85.00	85.00	85.00	.....	.....	140.00	140.00	18.195	21.995
	90.00	*90.50*	*90.00*	*90.00*	*90.00*	*90.00*	*90.00*	*100.00*	*100.00*	.....	.....	.....	.....
Pittsburgh	55.40	57.80	67.35	59.60	65.45	67.10	80.85	.....	.....	126.00	137.00	17.88	21.63
	73.60	*72.70*	*70.70*	*69.90*	*69.80*	*70.35*	*87.35*	*92.35*	*92.35*	.....	.....	.....	.....
St Louis	71.50	71.50	70.50	69.25	70.00	72.50	82.75	*83.25*	*82.00*	107.00	104.25	14.555	17.555
San Francisco d	*66.00*	*66.00*	*66.25*	*62.25*	*61.25*	*61.25*	*56.00*	*55.00*	*55.00*	.....	.....	7.33[g]	8.83[g]
Seattle	*50.00a*	*50.00a*	*52.25a*	*52.25a*	*51.00a*	*51.00a*	*50.75a*	*52.75a*	*57.75a*	.....	.....	.....	.....

Bold Face type, Southern Pine. *Italics, Douglas Fir.* Long leaf. [2] Roofers N. C. Pine. [3] Spruce. [4] Native. [5] Western Pine, No. 3 Common [7] Spruce [8] Norway Pine. ‡ Delivered. *a* Yard prices. *c* 5M ft. or less. *d* New series—sales through wholesale distribution yard (F.o.b purchaser's truck or carrier, San Francisco paid). For relation to mill prices formerly carried, see Lumber price report ENR (Vol. p. 944) June 13, 1946 *e* Plus sales tax *f* Up to 18 ft. *g* Lower rate by water shipment. *h* 50,000 lb. minimum. *i* FBM, scarce, no stable quotation, no ceiling *j* No fir available in the city at this time. *k* No carloads available These are retail yard ceiling prices.

Note: Special concrete form grade Fir Plywood. 4' by 8' panels, 5-ply, sanded 2 sides, water resistant glue, carload lots, delivered per 1,000 sq. ft. surface Seattle base price on ⅜", $95.15; on ½", $104.85; price includes oiling and sealing charges. For other centers add rail freight increment from table or proper size. For resin dipped treatment, add $10.50 per M.

GLASS, EXPLOSIVES, CHEMICALS

	WINDOW GLASS Discounts from jobbers list. Aug. 15, 1938 Single or Double Thickness A quality	B quality	EXPLOSIVES Per lb. 40% Ammonia Gelatin in 50 lb. cases delivered in 200 lb lots*	
Atlanta	74%	75%	$0.16	
Baltimore	78%[c]	79%	.16	
Birmingham	76%	76%	.115	
Boston	77%	78%	.16	
Chicago	77%	77%	.16	
Cincinnati	77–10%	77–10%	.16	
Cleveland	77%	77%	.20	
Dallas	76%	76%	.1725	
Denver	76%	76%	.165	
Detroit	77%	77%	.16	
Kansas City	77–10%	77–10%	.16	
Los Angeles	86%[d]	88%[d]	.1675	
Minneapolis	77%	77%	.165	
Montreal	40–10–2%[ab]	50–2%[ac]	.1775	
New Orleans	70%	75%	.17	
New York	80%	81%[f]	.23[f]	
Philadelphia	78%	79%	.16	
Pittsburgh	77%	77%	.1325	
St. Louis	77–10%	77–10%	.165	
San Francisco	66%	73%	.165	
Seattle	75%	75%	.1675	

Price of 60% Ammonia Gelatin is $0.01 per lb. higher than 40%

a Discount from list Sept. 1939; sales tax included, but 6% tax exemption not allowed for. *b* Single thickness. *c* Double thickness. *d* Discount from jobbers list Sept. 15, 1928. *f* In borough of Kings, Queens and Richmond, and in Manhattan south of Canal St., add delivery charge of $6.00 per trip. *g* Discount from jobbers list Jan. 16, 1946

* Urban prices influenced by service charges or local storage and delivery regulations do not consistently reflect quantity prices in less congested areas.

40% Ammonia Gelatin price ranges in other than urban areas, per lb.
(except Seismograph Grades)

	C/L 20,000 lb. net	Tons	200 lb. lots
E. of the Miss., except Fla. and Me.	$0.115	$0.14	$0.16
W. of Miss. to Rocky Mtn. States, Fla. and Maine	.12 –.1275	.145 –.1275	.165 –.1775
Rocky Mtn. States	.12 –.1325	.145 –.1625*e*	.165 –.1825*e*
Pacific N W States	.1175–.13	.1475–.16	.1675–.18
Pacific S W States	.1150–.1225	.145 –.1525	.165 –.1725

e F.o.b. Louviers, Colo., or Butte, Mont.

PILES, TIES* F.O.B.

PILES

Prices per linear foot, fir and pine, bark on f.o.b cars. New York. Fir based on Wash. and Ore. points to New York shipping area; pine based on freight from Norfolk.

Dimensions	Points	Length	By Rail Pine*	By Rail Fir
12 in. at butt	6 in.	30 to 50 ft.	$0.34	....
12-in.—2 ft. from butt	6-in.	50 to 59-ft.	.35	....
12-in.—2 ft from butt	6-in.	60 to 69-ft.	.36	....
12-in.—2 ft from butt	6-in.	90 to 100-ft.	....	.54
13-in.—3-ft. from butt	5-in.	91 to 100-ft.	....	.56
14-in.—2-ft. from butt	6-in.	50 to 69-ft.	.41	.63
14-in.—2-ft from butt	6-in.	70 to 79-ft.	.43	.57
14-in.—2-ft. from butt	5-in.	80 to 85-ft.	.54	....
14-in.—2-ft. from butt	5-in.	85 to 89-ft.	.57	....
14-in.—2-ft from butt	5-in.	90 to 100-ft.	....	.62

* Pine piling over 80-ft. available only in limited quantities.

RAILWAY TIES

Prices f.o.b. per tie for carload lots:		6"x8"x8' Untr.	6"x8"x8' Tr.	7"x9"x8'6" Untr.	7"x9"x8'6" Tr
Boston	Oak	$1.50	.....	$2.00	.....
	Pine	2.00	$3.00*j*	2.50	$3.00*e*
New York	S. L. Sap Pine	1.43/1.54	2.59	1.76	2.86
	Mixed Oak	1.71	2.59	2.42	3.58
Birmingham	Hardwood	1.00	1.60*a*	.....	2.25*a*
Chicago	Red Oak	.....	2.45/2.65*a*	.....	3.35/3.60
Los Angeles	Douglas Fir	2.10	3.35*a*	3.00	4.80*a*
Philadelphia	Red Oak	....	2.10*gj*	.....	3.25*ae*
St. Louis	White Oak	1.80	....	2.40	.....
	Red Oak	1.73	2.25*a*	2.19	3.25*a*
	Sap Pine or Cypress	1.80	.....	2.06	.....
San Francisco	Douglas Fir	1.25*bef*	.....	.....	3.00*caf*
Montreal	Birch or Maple	.....	1.65	1.04	.....

Tr.— Treated; Untr.— Untreated *a* Creosoted. *b* 6"x8"x8'6" *c* Empty cell. *d* Zinc. *e* Green. *f* F.o.b. cars. † Out of market. *g* January 1943 price none later available.

CHEMICALS

Water, sewage treatment, road work, f.o.b. carlots, New York

Bleaching powder in drums f.o.b. works, per 100-lb	$2.50– 3.10
Chlorine cylinders, liquid, per lb. delivered	.0525
Calcium chloride, 77–80% flaked, 100-lb. paper bag, del'd ton	18.50–35.00
Silicate of soda, 52 deg., in drums, f.o.b. works, per 100 lb	1.40
Soda ash, 58%, in paper bags, per 100 lb. dense	1.15
Sulphate of aluminum, commercial, in 100-lb. bags, per ton	23.00–25.00
Sulphate of copper, in bbl., per 100-lb	5.00

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME—DELIVERED

	STRUCTURAL CLAY TILE PARTITION — SCORED Per M lots of 2,000 pieces or over, 3x12x12 in	4x12x12 in	8x12x12 in	STRUCTURAL CLAY TILE — LOAD BEARING — SCORED Per M lots of 2,000 pieces or over 8x12x12 in	10x12x12 in	12x12x12 in	BRICK Per M in quantity Common backing	Straight hard	LIME Per ton Hydrated finishing	In paper Common hydrated	Carload lot, Pulverized, or lump
Atlanta	$110.00	$130.00	$230.00	$240.00	$270.00	$300.00	$24.00	$24.00	$19.00	$17.50	$17.50
Baltimore	90.00	95.00	175.00	200.00	260.00	300.00	23.75k	29.75k	20.00	15.00	2.50m
Birmingham	91.00	96.00	133.00c	216.00	.....	.....	18.50	21.00	19.11	15.05	16.05
Boston	105.00†	112.00†	210.10†	252.09†	.....	.....	20.00i	20.00i	21.00†	....	16.00
Chicago	92.10	98.40	185.20	x	x	x	17.00	18.00	18.00	16.00	.....
Cincinnati	75.39	80.39	150.90	170.91	242.35	277.25	33.00	33.00	16.90	14.40	.....
Cleveland	98.10	104.55	x	196.00	.....	.....	24.00	24.00	17.05	14.55	19.55
Dallas	77.25	83.00	165.00	198.00	254.50	315.00	17.25	19.00	19.00	15.00	15.00
Denver	105.25	119.00	198.25	230.00	263.50	315.25	26.50	.....	30.00j	24.00j	26.00
Detroit	92.70	96.70	174.50	198.80	257.20	294.30	24.00f	24.00f	22.00	20.00	20.00
Kansas City	.....	.....	.....	.....	.....	.....	17.50	18.50	30.40	24.00	24.00
Los Angeles	82.50†r	97.50†r	135.00c†r	210.00†r	368.00†r	460.00†r	16.50	18.50	16.50	17.50	17.50
Minneapolis	.....	112.00b	186.25b	112.00aa	.....	.....	18.50g	.....g	26.00bb	21.00bb	24.00bb
Montreal	92.50a	98.50a	196.25a	151.50a	.....	294.40a	22.16†u	29.41†u	12.50u	14.00u	8.00u
New Orleans	104.50	109.55	207.25	222.25	326.90	385.65	17.75	.....	18.30	12.08	14.10
New York	103.90	110.80	152.35	164.20hn	x	x	25.60	.....	22.00	16.00/17.00	19.00/20.00
Philadelphia	112.10	119.60	224.20	269.10	321.20	405.10	24.75	27.75	22.00	18.00	17.00
Pittsburgh	98.50	105.90	181.85	217.30	265.85	303.10	23.25	25.25y	19.40cc	16.90cc	2.55m
St. Louis	.....	.....	.....	.....	.....	.....	26.00s	25.00s	24.00s	20.00s	...65s
San Francisco	102.40	115.20	153.60	115.20t	.....	.....	21.00	.....	19.90	19.90	1.99m
Seattle	129.25	141.50	x	141.50ee	.....	.....	23.00k	28.00k	20.00s	20.00s	3.00m

* F.o.b. a Smooth. b Carload lots delivered to job. c 6 x 12 x 12 in Includes $3.50 per M. for delivery. g No quotation. h F.o.b Perth Amboy, N. J. i F.o.b. Warehouse only. j OPA Price. k $1.00 discount. m Per bbl., 180 lb. n 7½ x 7½ x 12. Speed tile. o Per bbl., 200 lb. r 5% discount 10 days. s 2% discount for cash. t 5½ x 8 x 11½. u 8% sales tax included. v sand lime. x Not available. y Stacked. z Pebble lime, price per 80 lb. sack. aa 5 x 8 x 12 in. bb LCL, delivered. ee Truck delivery.

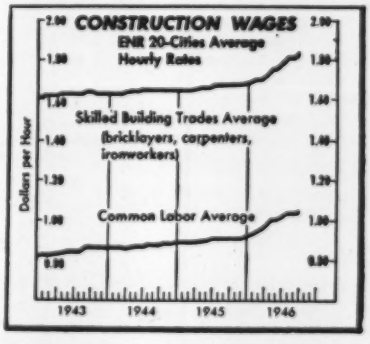
PAINT, ROOFING—F.O.B. CARLOAD LOTS

	RED LEAD Per 100 lb. in 660-lb. (Approx.) bbl. Dry a	WHITE LEAD Per 100 lb. in oil	READY-MIXED PAINT Graphite b	Per gal., drums Aluminum c	Ferric Oxide d	ROOFING SUPPLIES Carload lots f.o.b. factory Rolls, slate surfaced, 85-90 lb. per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Asphalt coating per gal.	Tar pitch 360 lb. bbl. per ton
Atlanta	$12.00	$15.875	$1.75	$2.70	$1.65	$2.06	$2.06	$2.06	$1.00	$36.00
Baltimore	11.75	15.50	2.00	3.00	2.50	2.35	2.90	2.90	.40	29.00
Birmingham	12.00	15.875	2.35	3.70	2.08	2.28	2.20	2.20	.32	28.70
Boston	11.75	15.50	1.75	2.50	2.31	2.00‡h	3.30‡u	3.30‡u	.25‡	21.00‡
Chicago	11.75	15.50	....	....	....	1.75h/	1.99h/	1.99h/	.33/	23.00/
Cincinnati	11.75	15.50	1.70	2.90	1.60	2.20	2.10h	2.10h	.33	25.00
Cleveland	11.75	15.50	....	....	....	1.71	1.63h	1.61h	.237	25.00
Dallas	11.75	16.25	1.88	2.95	.06l	1.89h	2.00h	2.00h	.65	37.00w
Denver	11.75	16.00	1.80	13.2k	16.15k	3.00	2.17h	2.17h	.29	29.00
Detroit	11.75	15.50	1.75	3.00	1.60	2.25	2.25	2.25	.50	23.00
Kansas City	11.75	15.625	2.30g	2.55g	2.16g	2.50	2.75	2.75	.52	.....
Los Angeles	12.00	16.00	2.00	2.60	2.50	2.10	1.50	....	.45	.....
Minneapolis	11.75	15.625	....	....	....	1.90o	1.85hi	1.85hi	.32	23.00
Montreal	.....	.....	2.50p	4.90p	3.15p	2.71	2.45t	2.45t	.84	1.83k
New York	11.75	15.50	2.03	....	1.82	1.9006	1.8468o	1.8468o	.26	23.00
Philadelphia	11.75	15.50	1.60/1.80	2.20	1.55	2.30	2.81	2.81	.32	23.00
Pittsburgh	11.75	15.50	1.95	2.40	1.75	2.15	2.09h	2.09h	.34	27.00
St Louis	11.74	15.50	2.28s	2.89s	1.96s	2.01h	2.01h	2.01h	.46	28.00
San Francisco	12.00	15.75	1.80	2.75n	1.35	1.7613	4.72	2.472	.3399	21.115
Seattle	12.00	16.00	1.90	3.00	....	2.15	2.16h	....	.35	31.00j

‡ Delivered. Note: Red lead in oil 50c higher than white lead in oil. a Red lead prices change frequently due to pig lead price changes. b U. S. War Dept. Spec. 3-49A c ASTM Spec. D266-31. d 80% minimum ferric oxide. f Distributors' price to contractors. g 55 gal. can. h Per roll, 65 lb. i Minneapolis and vicinity j Asphalt pitch k Per 100 lb. l Per lb. n May, 1941 price. o 60-lb. roll. p Plus 8% sales tax. s December, 1942 price. t Federal tax included. u 90-lb. roll. v Truck delivery. w Price previously misquoted — should have been listed as $37.00.

SKILLED AND COMMON WAGE RATES—PER HOUR

	Bricklayers	Carpenters	Struct. Iron Workers	Hoisting Engineers	Plasterers	Common Labor Building	Common Labor Heavy Const.
Atlanta	$2.00	$1.50	$1.625	$1.50	$1.62	$0.75	$0.80
Baltimore	1.90	1.775	1.90	1.625/2.00	1.725	.95	.95
Birmingham	1.9375	1.50	1.625	1.50	1.65	.65	.65
Boston	1.725	1.60	1.85	1.65	1.667	1.15	1.15
Chicago	2.00	1.95	1.95	1.95	2.00	1.30	1.30
Cincinnati	1.875	1.65	1.775	1.875/2.125	1.875	.95	.95
Cleveland	2.00	1.90	2.00	2.00	2.00	1.25	1.25
Dallas	1.9375	1.425	1.625	1.625	1.75	.80	.80/1.25
Denver	1.98b	1.70	1.70b	1.70b	1.90	1.10	1.10
Detroit	2.00	1.825	2.00	1.85/2.00	2.00	1.275	1.275
Kansas City	2.00	1.75	1.875	1.875	2.00	1.175	.90
Los Angeles	2.00	1.65	1.90	1.65	2.05	1.25	1.25
Minneapolis	1.825	1.625	1.75	1.70	1.85	1.15	1.15
New Orleans	1.625	1.375	1.625	1.55	1.625	.70	.80
New York	2.25b	2.10b	2.25	2.25b	2.25b	1.25	1.20
Philadelphia	2.00	1.775	1.90/2.00	2.25	2.00	1.025	1.025
Pittsburgh	2.15	2.00	2.00	2.05	2.00	1.15	1.15
St. Louis	2.00	1.95	2.00	2.20	1.90	1.00	1.00
San Francisco	2.05	1.75	2.00	1.85	2.00	1.25	.125
Seattle	1.975	1.675	1.80	1.90	1.975	1.275	1.275
Montreal*	1.17	1.06	1.11	1.07	1.17	.62	.65



b 7 hr. day. * Cost of living bonus now included in basic wage.

ENR Skilled Average: (Bricklayers, Carpenters, Ironworkers) $1.843

ENR Common Average: $1.072.

DAREX AEA

Takes the guesswork out of

AIR-ENTRAINED CONCRETE

It is generally recognized that the richness of the mix as well as the character and gradation of the aggregates used on the job largely determine the amount of air entrained. By using DAREX AEA as an addition at the mixer, you can meet any desired specification and control it.

DAREX AEA is a tested and proved water soluble air-entraining agent that is safe, harmless, and that comes ready to use. Simple automatic metering devices for DAREX are available for direct attachment to pavers or mixers. DAREX is not super sensitive. And best of all, DAREX AEA is economical to use and leads to direct savings.

Even though air-entrained concrete is not specified on your present jobs, you will find that the improved plasticity produced by DAREX—with little or no sacrifice in strength—gives you savings in time and labor that puts dollars in your pocket. Order a drum today and prove to yourself that DAREX can produce better concrete with a saving in time and labor. Warehouse stocks of DAREX are available nationally through our distributors.

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Check These Advantages of DAREX

- ✔ 1 Improved plasticity
- ✔ 2 Improved durability
- ✔ 3 Improved water-proofing properties
- ✔ 4 Controlled air
- ✔ 5 Economical
- ✔ 6 Comes ready to use

IN AIR-ENTRAINING CONCRETES IT'S

Controlled Air

THAT COUNTS

★

To get the most from air-entraining concrete—hold cement factor by redesigning mix—and use DAREX AEA.

THE WHITE TRANSIT

Unexcelled for Precision . . .

Known and used throughout the world on major Municipal, Railroad, Highway and Bridge work, the WHITE TRANSIT offers the utmost in precision construction, plus coated optics for greater accuracy and dependability—truly a fine instrument for unexcelled results.

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DAVID WHITE COMPANY

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New Engineering Books

(*Continued from page* 112)

TRANSPORTATION PRINCIPLES AND PROBLEMS—By Truman C. Bigham. 626 pp. McGraw-Hill Book Co., New York 18. $5.00.

MODERN ORGANIC FINISHES—By R. H. Wampler. 452 pp. Chemical Publishing Co., 234 King St., Brooklyn, N. Y. $8.50.

ENGLISH-FRENCH AND FRENCH-ENGLISH TECHNICAL DICTIONARY—By Francis Cussett. 591 pp. Chemical Publishing Co., 234 King St., Brooklyn, N. Y. $5.00.

DESIGN AND CONSTRUCTION OF CONCRETE ROADS—By R. A. B. Smith and T. R. Grigson. 168 pp. Concrete Publications Ltd., Westminster, S. W. 1, England. 8s. 6d. Available through G. E. Stechert & Co., 31 East 10th St., New York 3, N. Y.

ROCK TUNNELING WITH STEEL SUPPORTS—By R. V. Proctor and T. L. White. 271 pp. The Commercial Shearing & Stamping Co., Youngstown, Ohio. $2.50.

HAIL TO THE JEEP—By A. W. Wells. 118 pp., Harper & Brothers, New York 16. $2.00.

GROUND WATER IN THE BALTIMORE INDUSTRIAL AREA—By John C. Geyer. 299 pp. Maryland State Planning Commission, Baltimore 2, Md.

ECONOMICS IN ONE LESSON—By Henry Hazlett. 222 pp. Harper & Brothers, New York and London. $2.00.

Reports and Pamphlets

STANDARD CODE FOR ARC AND GAS WELDING IN BUILDING CONSTRUCTION—American Welding Society, 33 West 39th St., New York 18. 50c.

TRADE PRACTICE RULES FOR THE CONSTRUCTION EQUIPMENT DISTRIBUTING INDUSTRY—Federal Trade Commission, Washington, D. C.

CONCRETE FOR INDUSTRIAL BUILDINGS AND GARAGES—Portland Cement Association, 33 West Grand Avenue, Chicago 10, Ill.

PUTTING THE MISSOURI TO WORK—Bureau of Reclamation, Department of the Interior, Washington 25, D. C.

VORGESPANNTER BETON (No. 15): Die Berechfnung der Stockwerkrahmen (No. 16): Das Ausbeulen der auf einseitigen gleichmassig verteilten Druck beanspruchten Platten im elastischen und plastischen Bereich (No. 17): Schrumpfspannungen und Dauerfestigkeit geschweisster Tragerstosse (No. 18): Das Tragvermogen der Druckgurte offener Fachwerkbrucken mit parallelen Gurtungen (No. 19)—Mitteilungen aus dem Institut fur Baustatik. Leeman & Co., Zurich 2, Switzerland. Prices, 12, 9, 10, 5 and 6 franks, respectively.

DIE SEKTOR-HAKENSCHUTZE des Kraftwerkes Rupperswil-Auenstein—No. 3. Mitteilungen uber Forschung und Konstruktion im Stahlbau. Leeman & Co., Zurich 2, Switzerland.

DER EINFLUSS des Unterbaues auf Schaden im Strassenbau. Leeman & Co., Zurich 2, Switzerland. 4 francs.

CABIN JOHN, Md.—500,000 gallon toroidal bottom tank, 60' diameter, on 100' tubular column tower.

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ELEVATED STEEL TANKS by *Pittsburgh·Des Moines*

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HERE'S HOW
"Squeezing Water Upward"
SQUEEZES UPKEEP DOWN

PEERLESS HI-LIFT
REG. U. S. PAT. OFF.
PUMPS

FOR LOW-COST LIMITED WATER SUPPLY DEMANDS OF MULTIPLE INDUSTRIAL USES

CAPACITIES: 600 to 3300 gals. per hour for wells as small as 4" inside diameter.

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Gearturbo (right angle gear drive)
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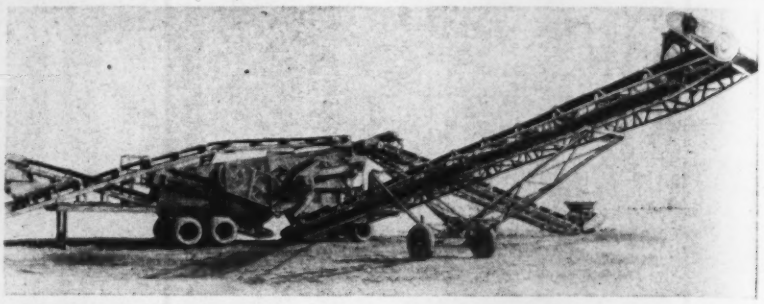
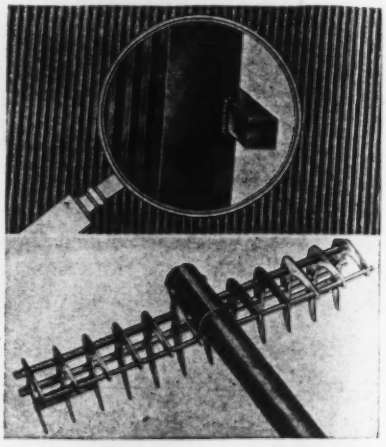
LATEST DEVELOPMENTS IN EQUIPMENT AND MATERIALS



Diesel - Electric Crushing Plant—In our Aug. 8 issue an erroneous description was given of the above illustrated machine. It is the No. 46-VE, the first of a new line of portable semi-electric powered duplex crushing and screening plants in which the screen and conveyors are driven by electric motors from power supplied by a diesel-electric plant. The roll crusher is driven by a flat belt to the diesel motor. A clutch provides for starting and stopping the crusher without interrupting the diesel drive to the generator.

Snake belt drives, numerous shafts, chains and sprockets, beveled gears and pinions and swivel drives have been eliminated. The operating height of the plant is about 14½ ft. and the screen can be lowered hydraulically so that in transit the plant is only 12½ ft. high.—*Pioneer Engineering Works, 1515 Central Ave., Minneapolis 13, Minn.*

Steel Climbers—Light-weight steel climbers of positive safety design for use on vertical "H" or "I" beams may be strapped over workers' shoes. The design is such that the hard-rubber gripping spurs give full 3-in. purchase on each side of the beam. When the wearer leans back, resting his weight on the climbers, they grip the beam section firmly with no possible chance for slippage. They will not mar painted surfaces—*Austin Supply Co., 3628 N. 20th St., Philadelphia 40, Pa.*



Trash Racks and Rakes—A "Power-Saver" trash rack has an improved all welded back bar construction, which is easy to clean. Vertical slats have no holes to weaken them and are welded into position so they cannot bend or twist. The racks can be quickly installed in sections by tack welding or clipping to the permanent installation. Heavy covering with a specially developed black asphaltum paint protects the rack against corrosion.

A "Power-Saver" stainless steel trash rake is offered as a companion tool. It has basket-type teeth that are spaced to engage the slats of the trash rack. —*Rodney Hunt Machine Co., Orange, Mass.*

Coated Electrodes—A new extrusion coated self-hardening electrode is now available with excellent arc characteristics, working equally as well with either an A-C or D-C machine. This Stoody coating is much stronger, has less tendency to pick up moisture, presents a better appearance, and is completely uniform. Other advantages are: No slag interference; more rapid deposition rate than dipped type elec-

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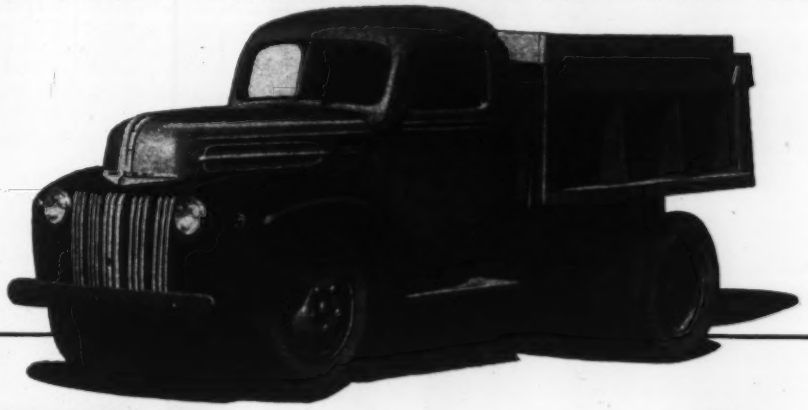
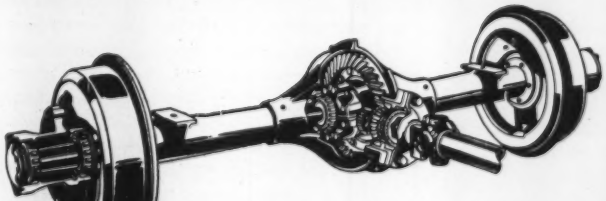


Dump Body by
MARION METAL PRODUCTS CO., Marion, O.

"FORD TRUCKS LAST LONGER!"

One big reason— FORD AXLES STAND UP!



Ford Truck axle shafts carry no weight load, because *ALL* Ford Trucks have ¾-floating or full-floating axles. All weight stresses are carried on the axle housing—none on the shafts—minimizing shaft breakage. Driving pinion is straddle-mounted on 3 large roller bearings, maintaining positive mesh with ring gear—no destructive springing away under stress. Differentials have 4 sturdy pinions, even in light duty chassis, spreading the load and strain.

Ford

ONLY in a Ford Truck will you find all these long-life features: your choice of two great truck engines, the 100-H.P. V-8 or 90-H.P. Six—triple-life Silvaloy V-8 rod bearings—Flightlight aluminum alloy, 4-ring pistons—efficient air- and oil-filtering—full pressure lubrication—heavy channel section frames, *doubled* between springs in heavy duty models—semi-centrifugal clutch—big hydraulic brakes, with non-warping, score-resistant cast drum faces for maximum life. More than 50 such long-life features contribute to Ford Truck endurance . . . and that endurance is proved by the fact that 7 out of 11 of all Ford Trucks built since 1928 are still in use. See your Ford Dealer!

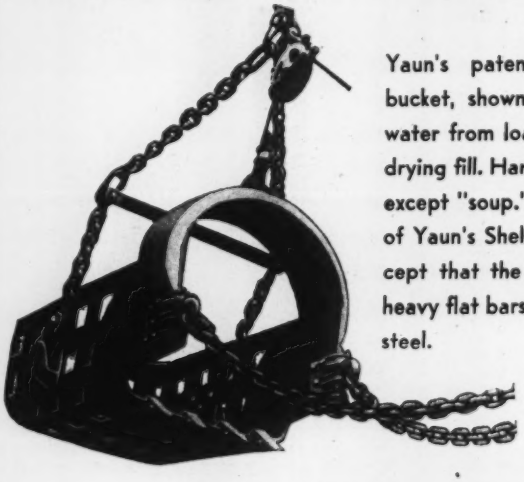
FORD TRUCKS

MORE FORD TRUCKS IN USE TODAY THAN ANY OTHER MAKE

WHAT YOU NEED IN A DRAGLINE BUCKET:

DURABILITY	All-welded construction. Stellited lip. Amsco manganese fittings and tooth bases with removable tooth points.
LIGHTNESS	Unnecessary weight cut to limit without sacrificing strength. More pay dirt; less deadweight.
EASE IN HANDLING	Free swing and balance. Wide, strong arch for easy digging and dumping. More cycles with bigger loads.
QUICK, CLEAN DUMPING	No suction to hold back discharge. Faster work with less wear on operator and equipment.
MULTI-PURPOSE USE	Handles any material. Sizes ⅜ to 24 yards. Fittings adapted for quick change-over.

IT ADDS UP TO A YAUN BUCKET!



Yaun's patented Basket-Type bucket, shown here, eliminates water from load, assures quick-drying fill. Handles any material except "soup." It is a duplicate of Yaun's Shell-Type bucket except that the rear is made of heavy flat bars, instead of sheet steel.

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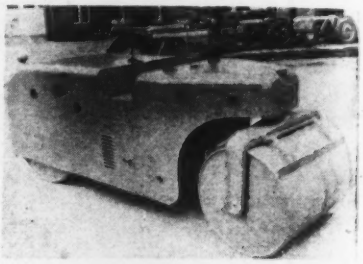
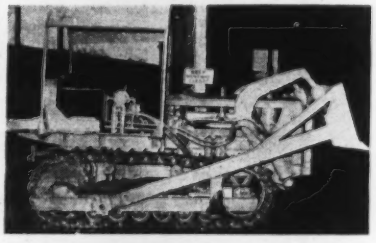
trodes; solid, dense deposits with an absolute minimum of porosity; easy slag removal while deposit is still red hot.—*Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.*



Variable Weight Tandem Roller —A new 5 to 8 ton variable weight tandem roller has exclusive fluid drive coupling for improved performance and gear life, and completely eliminates the master clutch. The coupling transmits engine power from driver to impeller through the medium of oil; the engine cannot be stalled or killed due to overload.

The tandem is powered with a Hercules 6-cylinder gasoline engine. The compression roll has a diameter of 52 in. and a width of 50 in.; the 50-in. wide steeling roll is 40 in. dia. Total roller weight is 16,100 lb.—*Huber Mfg. Co., Marion, Ohio.*



Bulldozer Lift-Arm –Improved vision and increased lif are provided by new lift-arm patented by G. H. Bartlett and called "Budd-Blade." Chief distinguishing feature is location of hydraulic lifts inside treads to allow operator at all times to see lower corner of blade and eliminate danger of damage. Device is designed so that lifting unit may be mounted on roller or motor frame.—*Vancouver Welding & Repair Co., Vancouver, Wash.*

Lightweight Dockboards — Magnesium dockboards weighing one-third to one-quarter as much as steel boards of equal strength are available to replace heavy steel platforms used as bridges between loading docks and freight cars or trucks. Boards are reinforced and are designed to stay securely in position while in use. — *Magnesium Company of America, Inc., 160 N. La Salle St., Chicago, Ill.*

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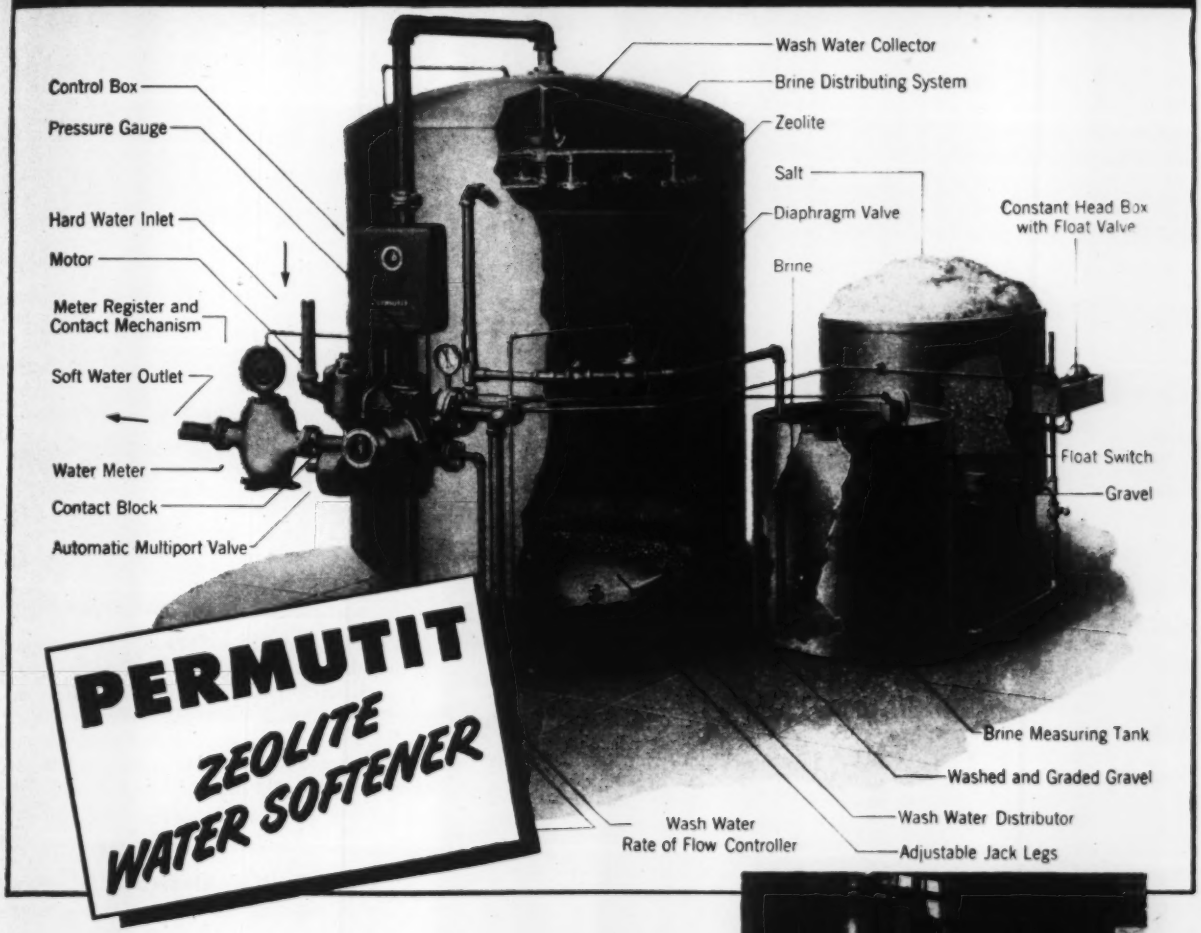

THE zeolite process—originated by Permutit—is the *simplest method* for removing hardness from water. Original cost of equipment is lower than that of any other form of water softening. And in Permutit's *completely automatic* zeolite softener, the process reaches its highest efficiency.

In a Permutit* automatic zeolite unit—simple and compact—the water is softened under positive electrical control . . . with a minimum of attention, a minimum of manpower. Backwashing, regeneration and return to service are all automatic. Process is particularly adaptable to well waters.

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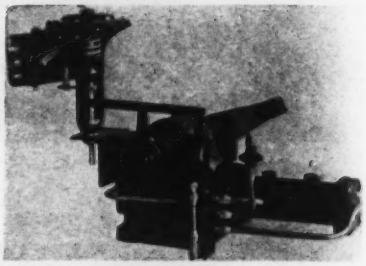

Booster Cylinder—Using standard diaphragm top, oil-operated hydraulic booster cylinder for air-operated controllers provides high power amplification and permits exact positioning of heavy valves, bin gates, etc., in accordance with applied pneumatic loading pressure. Cylinder may be of crank or straight reciprocating type. Straight cylinders are available up to 8-in. bore and 30-in. stroke.—*Askania Regulator Co., 1603 S. Michigan Ave., Chicago, Ill.*

Fire Fighter — New 750-gal. triple combination fire fighter employs six-cylinder 190 hp. engine, on 160 in. wheel base four-wheel-drive truck. Open-type body of 12-gage steel has capacity of more than 1,200 ft. 2½-in. hose and 400 ft. of 1½-in. hose. — *The Four Wheel Drive Auto Co., Clintonville, Wis.*

Hard-Facing Electrode — New wear-resistant electrode for hard-facing heavy equipment is fabricated rod consisting of mild steel tubes filled with alloying elements. Deposits are said to bond well with manganese steel and its use is especially recommended on wearing surfaces of all heavy equipment made from this metal. It is available in ¼- and ⅜-in. rod sizes—*Stoody Co., P. O. Box 429, Whittier, Calif.*

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Further proof of leadership in engineering and manufacturing is shown by the La Crosse DF 4 Semi Trailer carrying the La Crosse built Mississippi Tugboat. Scientific application of proven trailer facts brings to you the durability and versatility of the complete line of La Crosse Heavy Duty Trailers. For those unusually WEIGHTY transportation problems —look to La Crosse for your answer.

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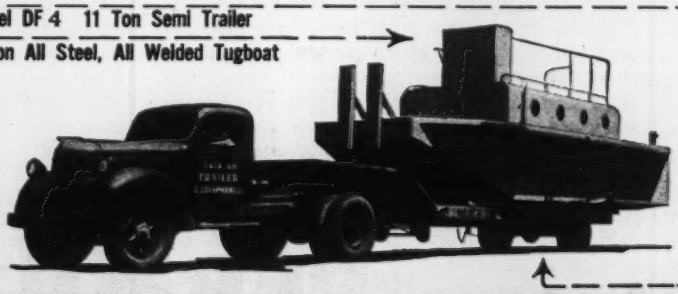

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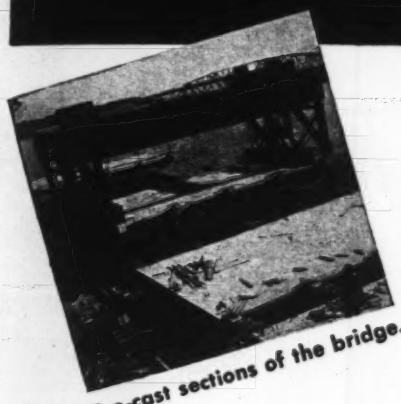
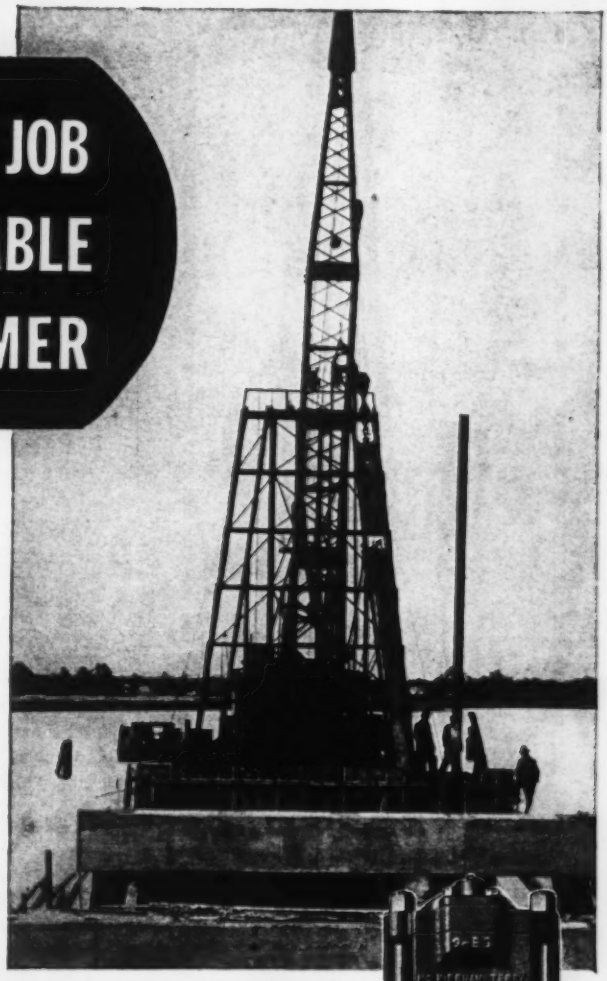
THIS UNUSUAL BRIDGE JOB REQUIRED A DEPENDABLE PILE HAMMER



Pre-cast sections of the bridge.



Operating in a specially constructed steel-frame five-pile guide, this McKiernan-Terry Pile Hammer drove sets of five piles comprising each bent without need of shifting the floating rig.

In constructing the new reinforced concrete highway bridge at West Point, Va., the Diamond Construction Company, of Washington, D. C., employed a "production line" procedure of precasting the entire bridge in 40-foot sectional spans, installing them section by section.

To support these spans, precast concrete piles had to be driven, in bents of five piles each, through soil ranging from coarse sand to dense blue clay under water.

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No pile-driving job is too unusual for McKiernan-Terry Hammers to handle. And they are now available for prompt delivery in a standard line of 10 double-acting hammers, 5 single-acting hammers and 2 double-acting extractors.

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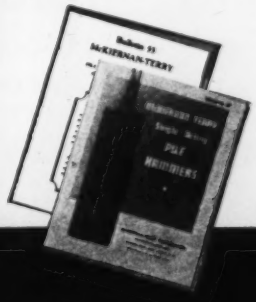

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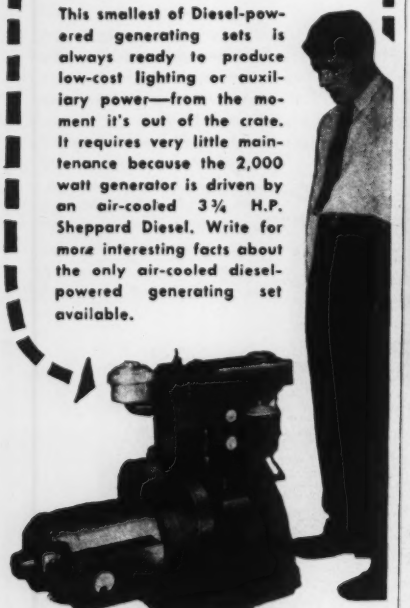

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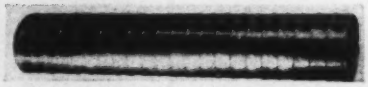
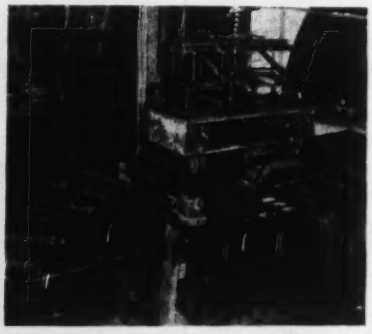


Spiral Tubing—Ready-made, inexpensive concrete forms, mine ventilating shafts and portable irrigation systems are among applications of new lightweight spiral tubing. One man can carry 60 ft. and can lay several thousand feet per day. Tubing is spirally formed from metal strip with edges joined in continuous four-ply lock-seam. Pipe with .030 in. walls, will stand pull or push of more than a ton without measurable distortion. Diameters available range from 2 to 8 in. in any length that can be shipped.—*Pratt Industries, Inc., Frankfort, N. Y.*

Slurry Pump—Only four bolts need to be removed to dismantle Type R slurry pump, designed for handling sludges, silts, abrasives and solids. Impeller shaft sleeve can be renewed without touching suction or discharge piping. It is made in choice of eleven different metals, ranging from gray iron to Morris Flint metal. Pump takes its suction from drive side, so packing is subjected only to suction or positive-head pressure.—*Morris Machine Works, Baldwinsville, N. Y.*



Concrete Block Maker—Gyro concrete machine makes five blocks at one time at rate of ten blocks per minute. It eliminates all hand work as blocks are carried on pallet that rolls on gravity conveyor from point of vibration to point of entering curing tunnel or shipping docks.—*Western Tool & Mfg. Co.*, 3409 *E. 18th St., Kansas City 1, Mo.*

Scaffold Brackets—Scaffolding may be erected without injury to lumber with aid of new knife-grip scaffold bracket. Using 4x4 uprights and 2x3s and 2x6-

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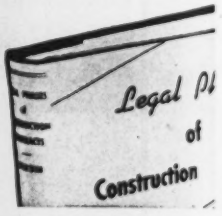

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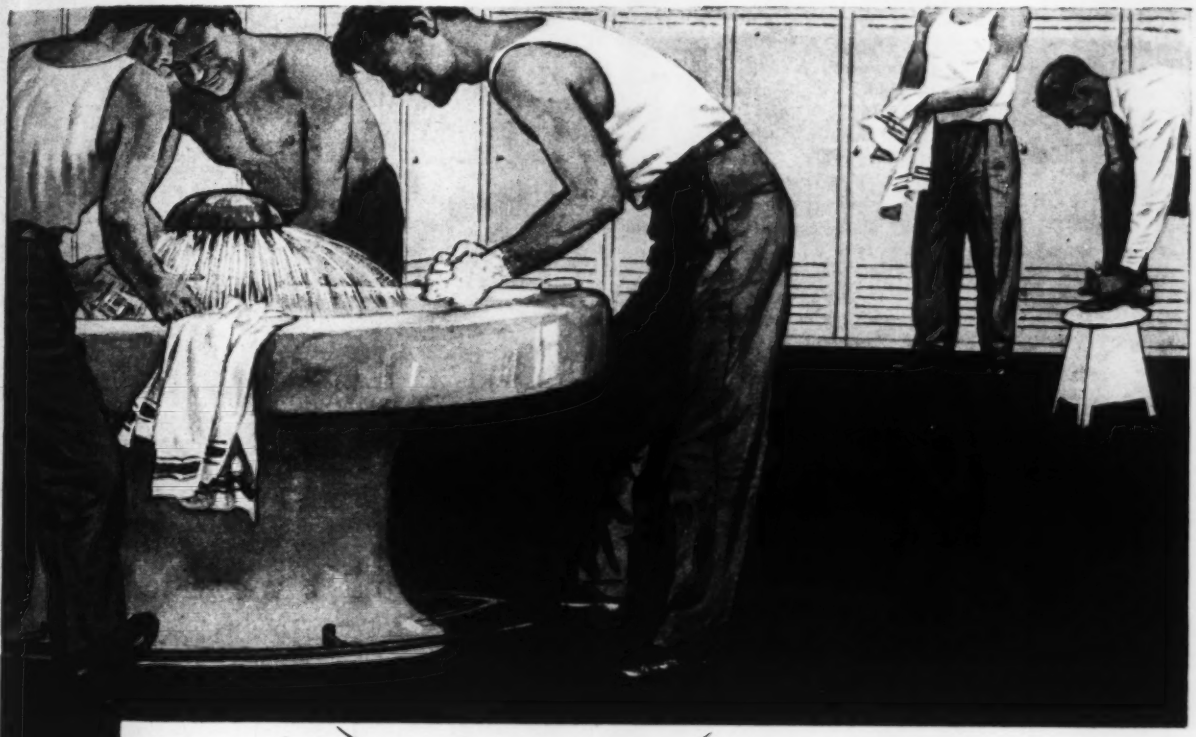

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You can prevent most of these losses. Specify Flintdek* as a coating for hazardous areas.

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Since Flintdek is fire-retardant and highly resistant to water, gasoline, oils, alcohol, fats and greases . . . since it does not flow and resists indentation and marring at temperatures up to 170 degrees F. . . . you can use it effectively almost anywhere.

Coat floors around machinery. Use it in shower and locker rooms . . . on steps and ladder treads . . . on ramps and platforms . . . in elevators . . . wherever you have a hazard. Available in three colors: slate blue, green and red.

We'll be glad to give you full details on Flintdek and any other of the numerous Flintkote products for industry. Mail the coupon for literature.

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CHANGING TIMES SHOULD BE SUCCESSFUL TIMES FOR EXECUTIVES!

Today, war worries have been succeeded by an atomic turmoil. Far-reaching changes have always followed wars—and the man who has kept pace always comes out on top.

Come what may, one need is never completely filled—the need for competent executives to direct business and industry. In tumultuous times like those of today, this demand multiplies. Right now, the outlook for ambitious men is brighter than ever before—if they have the training to take advantage of opportunities.

The training needed is not narrowly specialized, but goes broad and deep, probing the basic principles that underly *all* business. It provides the knowledge that enables men to direct the activities of others not in one department or one kind of business, but in *any* business. It supplies the "know how" that enables top executives to manage *any* business.

How to get such executive training

Training of this kind is provided by the Modern Business Course and Service of the Alexander Hamilton Institute. The Course covers the four major functions of business—Production, Marketing, Finance and Accounting. It turns out not accountants, or salesmen or production men, but *executives!*

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This knowledge takes years to acquire by ordinary methods. Through Institute training, the process is concentrated and thus finished in a matter of months. It does not interfere with a man's present position, being taken at home, during spare hours. More than 430,000 men have subscribed; many call it "a turning point in their lives."

Many prominent contributors

One reason why the Institute Course is so basic, thorough and scientific is found in its list of prominent contributors. Among them are such men as Thomas J. Watson, President, International Business Machines Corp.; Frederick W. Pickard, Vice President and Director, E. I. du Pont de Nemours & Co.; Clifton Slusser, Vice President, Goodyear Tire & Rubber Co., and Herman Steinkraus, President, Bridgeport Brass Company.

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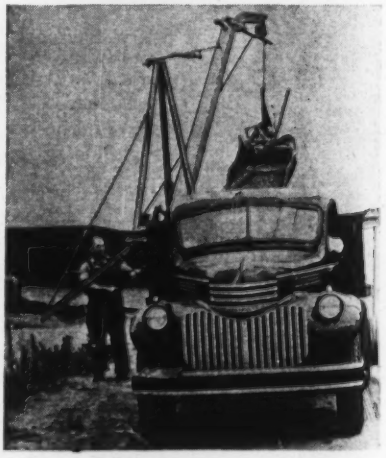
for horizontal members, scaffold is held together by brackets and may be made more rigid, if necessary, with steel corner braces. Scaffolds made in this manner have withstood 12-ton test.—*Andrews Machinery, 404 N. W. Broadway, Portland, Ore.*

Spray Process Roofing—Successful application of cold process materials—both adhesive and top coating—by spray, for built-up roof construction or maintenance has been developed. Spraying speeds rate of application by a third, makes a more uniform coating, covers hard-to-reach areas and enables simultaneous dampproofing of parapets and covering of adjacent metal surfaces. Spray equipment that has proven suitable for handling Flintkote Cold Process materials is now available in one convenient "package unit": a compressor, a spray gun of the pole type, an Alemite Versatal pump, a hose reel, a parapet roller, 175 ft. of material hose and 190 ft. of air hose.—*The Flintkote Co., Inc., 30 Rockefeller Plaza, New York 20, N. Y.*



Scrape-Loader—The only truck accessory which scrapes and loads in one operation, the Cascade Scrape-Loader is a simple, efficient, inexpensive accessory for any standard dump truck. If a standard maintenance truck crew of three men is capable of an average output of 7 to 8 truck loads per day, the

Travel-hungry owners of new cars won't be content with around-the-block driving. They'll be taking to the open road—heading for seashore, lake or mountains, or distant hunting ground, or maybe just to satisfy the urge to travel.

As car and truck production mounts, motor traffic promises to surpass anything this country has seen. That means more roads. Two-lane, four-lane, even six-lane highways will be needed to handle this heavier traffic swiftly and safely.

If you have a contract for a highway job, Bethlehem's steel service to contractors offers advantages well worth considering. By placing a single order with Bethlehem for all the steel needed on a highway project you save in several ways. You save bookkeeping. You save needless follow-ups. And you save by avoiding delays.

When you use Bethlehem's steel service all the steel required for the job is supplied from a single, dependable source. Shipment from a strategically-located Bethlehem warehouse is so scheduled that each individual item is delivered to the job when you are ready for it.

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Road Joints — Reinforcing Bars
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STEEL for HIGHWAYS

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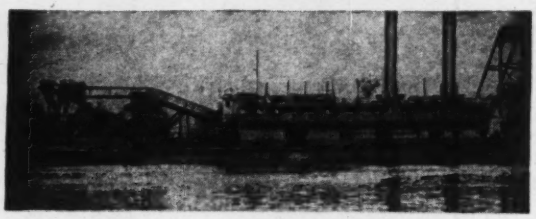
DREDGING



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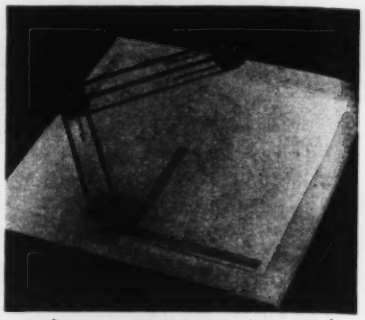
300 PENN AVENUE, PITTSBURGH 22, PA.
(Distributor for THE TRI-LOK COMPANY)

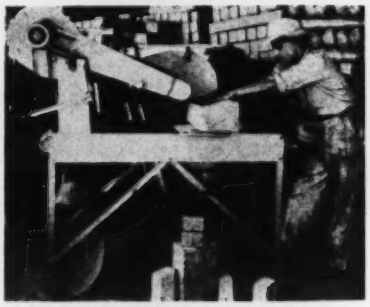
DRAVO

scrape-loader output, under similar conditions, with driver and one man, is said to be about 25 truckloads.

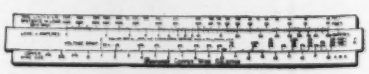
This maintenance tool requires no power plant or power take-off from truck motor. One man operates the scraper in the ditch, the driver remains in the truck. No skilled operators are required.—*Cascade Mfg. Co.*, 2349 *N.W. 29th Ave., Portland, Ore.*



Drafting Machine—The Universal Boardmaster is said to be an advance over previous drafting machines in ease of operation, precision, accuracy, ruggedness and versatility. The "centralized control group" locates every operating control at the fingertips of the left hand. By the simple and rapid assembly of packaged accessory units, it may be converted from a sloping or horizontal machine to a vertical machine.—*Universal Drafting Machine Co., Cleveland* 14, *Ohio.*



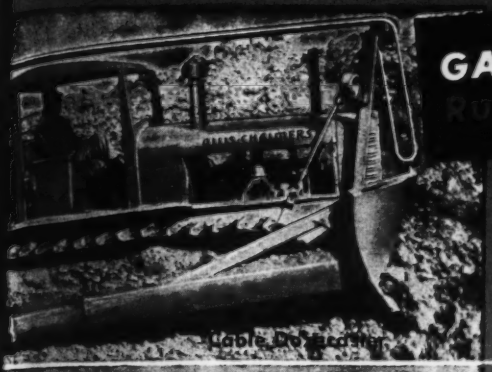
Portable Dustless Masonry Saw—Tile, brick and concrete block can be accurately cut on job by new masonry saw with self-contained water supply system. Circulating pump, belt-driven from motor, sprays fine mist though concealed nozzle over cutting surface to prevent dust and cool circular blade. —*Champion Mfg. Co.*, 1307 *Washington St., St. Louis* 3, *Mo.*



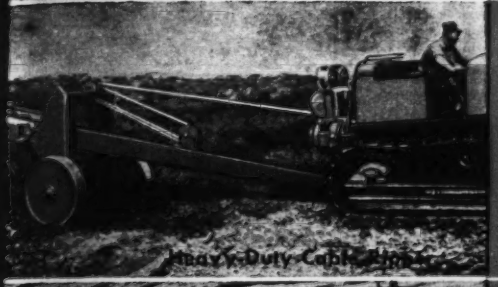
Copper Wire Selector—New calculator of slide-rule type gives wire size to be used for any load (1 to 100 amp), at any distance from fuse box (10 to

Down-to-Earth Engineering

GAR WOOD Cable Controls Feature Rugged Simplicity and Direct Action Pull



Cable Dozer and Scraper



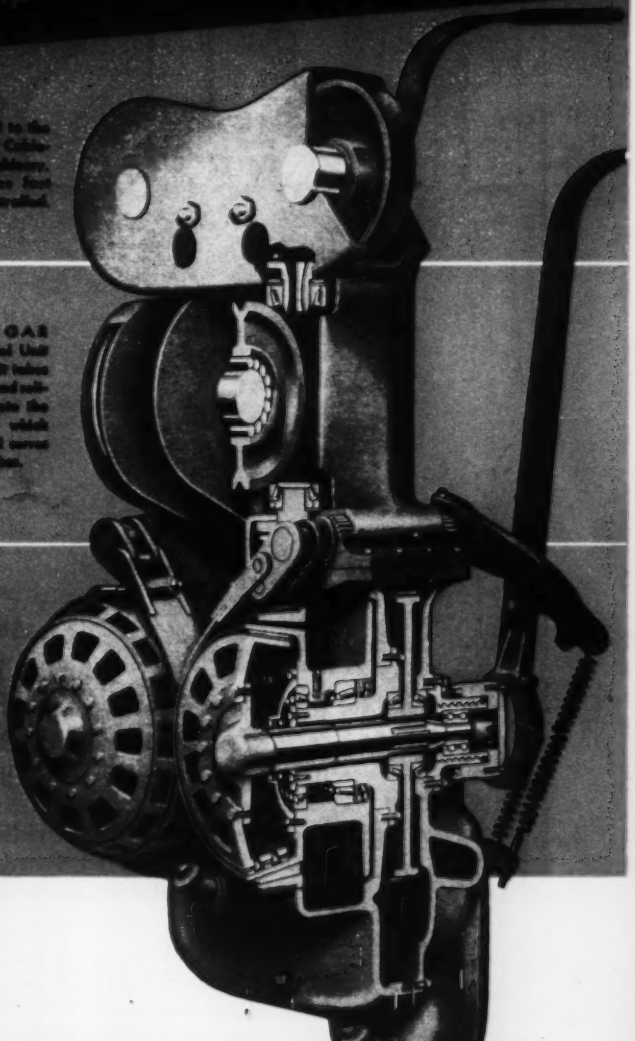
Heavy-Duty Cable Ripper

Cable Scraper

The cable goes direct to the job in GAR WOOD Cable-Controlled Road Machinery. As a result, it has fast action, positively controlled.

The Job-proved GAR WOOD Cable Control Unit (right) has everything it takes for smooth operation and reliable performance. Note the sturdy steel housing which prevents distortion and cannot get out of alignment.

Outside clutches and sprockets, self-aligning bearings and shafts are heat treated and are readily accessible. Roller bearings throughout and spur type gears keep adjustments at a minimum.



PROVED through the years on the toughest of jobs. Made more rugged than ever by the lessons learned in war action on every front, from Guadalcanal to Okinawa and from Oran to Berlin.

GAR WOOD Road Machinery and the famous GAR WOOD Cable Control Power Unit offers practical design and sound construction, well engineered and honestly built—equipment that *holds together* and can be operated with an absolute minimum of down time. *If it's* GAR WOOD, *it's good.*

See your Allis-Chalmers dealer. He'll be happy to give you all the facts and show you Gar Wood Earth Moving Equipment *on the job* in your own vicinity.

GAR WOOD ROAD MACHINERY
WITH ALLIS-CHALMERS DIESEL POWER

Sold Through
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Dealers Everywhere

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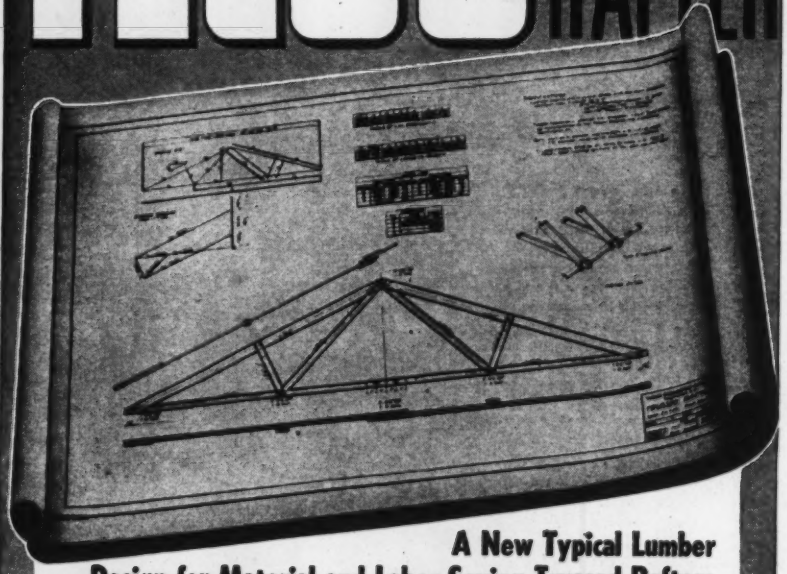

A New Typical Lumber Design for Material and Labor Saving Trussed Rafters to Help Architects and Engineers Plan Veterans' Housing.

In 180 Veterans' houses in South Bend, Indiana, 72,000 F. B. M. of lumber is being saved with Teco rafters. This means 7 more houses can be provided out of available supplies. In addition, hand fitting of rafters is minimized, line production and rapid assembly economize on manpower and money. Clear spans provide flexibility of interiors—now and later.

Get Teco's FREE trussed rafter design, #585. Mail the coupon today for your copy.

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Gentlemen:

Please rush my copy of your typical rafter design #585 for economical house construction.

Name.....

Firm.....

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1,000 ft.), for 32, 110, 220 and 440-v. lines, according to maximum voltage drop that can be tolerated in particular installation. Proper use of this rule should be a boom to the civil engineer who has forgotton his electrical courses and must specify wiring adequate for construction job.—*Lawrence Engineering Service, 36 N. Linwood Ave., Peru, Ind.*

Heavy Duty Expansive Bit—Holes 1½ to 3½ in. in hard or soft wood can be bored with new expansive bit with ½-in. straight shank, for use in electric drill or drill press. Center lip, which cuts away core at center of hole, extends back to form clamp that firmly holds adjustable blade in diameter set. These bits are equipped with two cutting blades, one long and one short, to cover range of tool.—*Bruno Tools, 9330 Santa Monica Blvd., Beverly Hills, Calif.*

Hydraulic Journal Jack —These 50-ton jacks are specially designed for general high-lifting jobs in railroad repair shops, for bridge work and for heavy general industrial lifting. They have two speeds—fast for quickly raising light or medium-heavy loads and normal or standard for raising capacity loads. Raising is by easy pumping action; lowering is regulated by simple control valve. Loads may be held indefinitely at any height.

Model 50-B-12 has height closed of 12 in., rise of 7 in. and weight of 120 lb. Model 50-B-26 has height closed of 26 in., rise of 20 in. and weight of 200 lb.—*Buda Co., Harvey, Ill.*

and **GOLDEN-ANDERSON**

VALVES

WILL PROVIDE

✔ *Lasting Safety*

✔ *Dependability*

When the specifications and blueprints are drawn up be sure they read "Valves by GOLDEN-ANDERSON." For nearly *half-a-century* GOLDEN-ANDERSON Valves have been used and specified on large and small installations all over the nation (and many hundreds have been exported, too). Over 1,500 standard sizes and types, plus individually engineered types to solve most any difficult requirement. Send your inquiries today!

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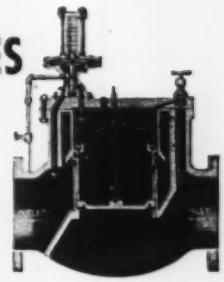
GOLDEN-ANDERSON
SINGLE-ACTING
SEMI-THROTTLING

ALTITUDE VALVES

Installed in upstream line to tanks, standpipes or reservoirs, the valve sensitively maintains any desired water level to prevent overflow. Available in series 15, 25, 30 and 40, sizes 2 inch to 36 inch.



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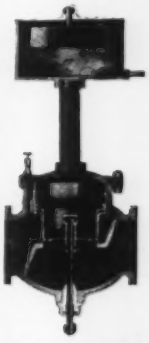
BALANCED
COLD OR HOT WATER

FLOAT VALVES

For coagulating basins, mixing chambers, etc., to control the rate of influent flow in proportion to effluent service demands and to keep a uniform water level under low or high inlet heads. Available in sizes 3 inch to 36 inch.



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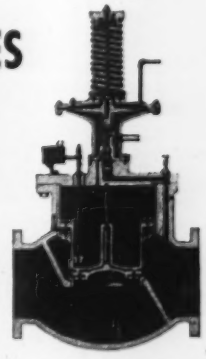
GOLDEN-ANDERSON
STOP-STARTER
SINGLE-ACTING

ALTITUDE VALVES

Installed in influent line to tanks, standpipes or reservoirs having a separate discharge on by-pass for service distribution, the valve maintains a uniform water level between 3 inch to 12 inch variation and by means of "stop-starter" switch stops pump.



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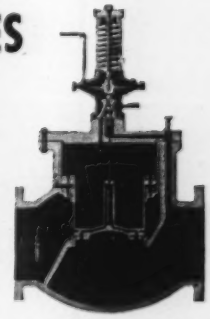
GOLDEN-ANDERSON
STANDARD
SINGLE-ACTING

ALTITUDE VALVES

Where a separate discharge line or by-pass arrangement is used for removing storage water, the valve is placed in the upstream pressure line and will maintain a uniform water level in tank, standpipe or reservoir within a range of 3 inch to 12 inch.



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STEEL MEASURING TAPES

The man who knows and uses measuring tapes instantly recognizes the superiority of WYTEFACE "A" Steel Tapes. Raised black graduations and rims, on a crack-proof white surface, make these steel tapes as easy to read in the brightest glare as in the dimmest light. See WYTEFACE "A" heavy duty and general purpose steel tapes at your dealer's, or write for catalogue.

WYTEFACE Steel Tapes and Tape Rules are protected by U. S. Patent 2,089,209.

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NEW YORK • HOBOKEN, N. J.
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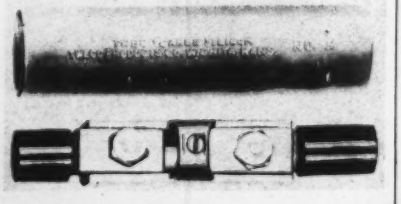
Rotary Drill Press Planer—Easily fitted to any drill press in 30 sec., Saf-T-Plane will plane, rout, panel, head or rabbet to any depth in wood-working materials. Features are single cutting blade, one-spot blade adjustment, protective hand and eye guard and light weight.—*A. D. McBurney, 939 W. 6th St., Los Angeles, Calif.*

Crushing and Screening Plant—First in new line of portable semi-electric powered duplex crushing and screening plants is No. 46-VE. Screen and conveyors are driven by electric motors from power supplied by diesel electric plant. Roll crusher is driven by V-belts from jaw crusher, which in turn is driven by flat belt to diesel motor. Clutch provides for starting and stopping crusher without interrupting diesel drive to generator. Operating height is 14½ ft. and screen can be hydraulically lowered so overall height in transit is only 12½ ft. Moving weight is 64,000 lb. Low-angle type, 3½-deck, 4x12-ft. screen is used with 10x36 in. jaw crusher and 40x22-in. roll crusher.—*Pioneer Engineering Works, 1515 Central Ave., Minneapolis 13, Minn.*



Welding Cable Splicer—A complete new line of Tweco welding cable splicers has just been announced which provides a quick repair of broken cables or salvage of short lengths. A simple clamp cable connection on each end, with provision to solder between the cable ends, assures an efficient connection. A fibre sleeve covers this permanent cable splicer.

The splicer is made in three sizes to cover the full range of welding cables—Size "S" for small No. 4, 2, or 1 cables;

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ELASTIC STOP NUTS

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M. D. Larkin Co., **SPRINGFIELD**, Ohio
Syracuse Supply Co., 314-318 W. Fayette St., **SYRACUSE**, New York
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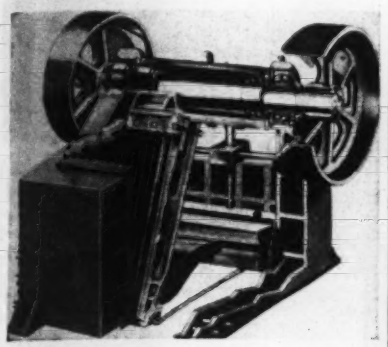
James W. Pyke & Co., Ltd., 388 St. James Street, West, **MONTREAL**, Quebec
116 Broadway, **NEW YORK** 6, New York
P. D. DeWitt, 313 East Welsh Road, **PHILADELPHIA**, Willow Grove, Pa.
H. J. Forst, 325 Catalpa Place, **PITTSBURGH** 16, Pennsylvania
2330 Vauxhall Road, **UNION**, New Jersey

The application advertisement shown opposite this column explains the permanent protection provided by all types of Elastic Stop Nuts.

Size "M" for medium No. 1/0 or 2/0 cables; Size "L" for large 3/0 and 4/0 cables.—*Tweco Products Co., Wichita 1, Kansas.*



Roller-Bearing Crusher— Useful as portable stone plants, for highway work, etc. the new WRB welded base roller-bearing crusher is said to have maximum strength and minimum weight, with generous capacity.

Two distinct crushing blows are given by each revolution of the shaft, produced by high eccentric and radial toggle action. The primary blow is at top of jaw, secondary stroke at bottom, with natural gravity forced feed.—*Universal Engineering Corp., Cedar Rapids, Iowa.*

Prefabricated Door — Where door space is inadequate or where present doors require replacement, the Fleming vertical lift door, entirely prefabricated, may be installed by mounting on the outside wall of the building. This method eliminates interference with overhead pipes, wires or equipment inside the building. In replacing an old door this installation is made without altering either the building wall or the original door space.

Upper and lower sections of the door, travelling vertically, are synchronized through gears to open or close fully at the same instant, the lower section travelling at twice the speed of the upper. When open, it gives 100 percent clear area around the door jambs for the movements of workmen engaged in loading or unloading operations, and for the entrance of vehicles. Opened or closed it occupies no usable space within the building.—*Fleming Steel Co., New Castle, Pa.*

Acid-Resistant Work Suit— Made from textile sheeting coated black with Koroseal, a new work suit is resistant to abrasion and practically all solvents and acids. Jackets and pants are furnished separately or as a unit. The fly-front jacket has concealed ball and socket fasteners, and the bib-type pants have adjustable shoulder straps.—*The B. F. Goodrich Co., Akron, Ohio.*

A NEW *U-Bolt Nut* THAT HOLDS PERMANENTLY

—a NEW ESNA Elastic Stop Nut ends the greatest threat to spring life

Loose, or unequally loaded fastenings are the most frequent causes of leaf spring breakage. More than 4,706,000 spring repair jobs have been handled annually in dealer, independent and fleet owner service shops. Many of these could have been avoided.

ESNA has a solution—the NEW U-Bolt Elastic Stop Nut that can be . . . applied to meet the original manufacturer's recommended specifications . . . self-locked in position with the Red Elastic Collar so that no amount of shock or vibration can disturb its setting . . . depended upon to carry a bolt loading of 70,000 psi with its extra-long, extra-strong body.

ESNA U-Bolt Nuts—like all Elastic Stop Nuts—are designed to prevent unnecessary repairs and reduce overhaul time. They are self-locking, easily removed, reusable. They protect permanently against Vibration, Corrosion, Thread Damage, Liquid Seepage, and Costly Maintenance. For further information address: Elastic Stop Nut Corporation of America, Union, New Jersey. Representatives and Agents in principal cities.

The RED ELASTIC COLLAR
—denoting an ESNA product—

. . . is threadless and permanently elastic. Every bolt—*regardless of commercial tolerances*—impresses (does not cut) its full thread contact in the Red Elastic Collar to fully grip the bolt threads. In addition, this threading action properly seats the metal threads—and eliminates all axial play between bolt and nut threads.

All ESNA Elastic Stop Nuts *—regardless of size or type—* lock in position anywhere on a bolt or stud. Vibration, impact or stress reversal cannot disturb prestressed or positioned settings.

ESNA
TRADE MARK

ELASTIC STOP NUTS

***PRODUCTS OF:* ELASTIC STOP NUT CORPORATION OF AMERICA**

FALL CONCRETE that avoids 50° slow-up with

SOLVAY CALCIUM CHLORIDE

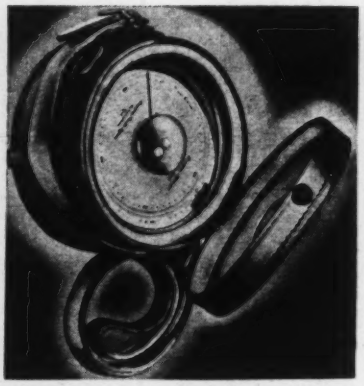
FASTER!
STRONGER!
SAFER!

Temperatures of 50°F., or lower tend to lower the development of strength. This means slower form removal and delay in finishing the job. By adding SOLVAY Calcium Chloride to the mix, you offset the effect of low temperatures. It also produces concrete of high ultimate strength. This cuts costs three ways: (1) Earlier form removal and reuse. (2) Quicker use of finished concrete. (3) Safer, stronger concrete.

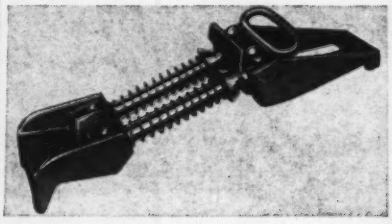
•

SOLVAY SALES CORPORATION

40 Rector Street New York 6, N. Y.



Surveying Altimeter— Great accuracy and sensitivity are claimed for the new SA series of surveying altimeters, made in several models to cover all ranges of elevation above and below sea level. The instrument is rugged and comes encased in a leather carrying case with hand and shoulder straps, and weighs 2 lb. In this device diaphragm movement is directly and without friction read in terms of inches pressure or feet altitude on the dial.—*American Paulin System, Los Angeles, Cal.*



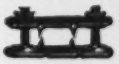
Track Shifter—Fast and positive track lining with minimum manpower is said to be possible with the Simplex track shifter, which may be used to line any type track in any type ballast, swings, sharp curves, frogs, crossovers, etc. Powered by conventional track jacks, it is recommended that the Simplex be used in sets of two.—*Templeton, Kenly & Co., 1020 South Central Ave., Chicago 44, Ill.*

Electric Fork Truck—Conservation of aisle width is claimed for the Lewis-Shepard 4,000 lb. capacity electric power fork truck. Using a 48 in. fork and carrying a 48 in. load, this truck will enter an aisle 12 ft. wide and, in one continuous forward travel of the truck, make a single right angle turn and right angle stack, with no backing or filling—*Lewis-Shepard Products Inc., 222 Walnut Street, Watertown 72, Mass.*

Self-Propelled Arc Welder — Originated to simplify welding operations where the machine must be taken directly to the job, a new unit consists of a 300-ampere welding generator and

KEEP YOUR CONVEYOR BELTS GOING

FLEXCO H D RIP PLATES are used in repairing rips and patching conveyor belts. Their use saves expensive replacements and extended shutdowns.



FLEXCO H D BELT FASTENERS make a strong, tight butt joint with long life. Recessed plates embed in belt, compress belt ends and prevent ply separation. Six sizes in steel and alloys.

● Avoid shutdowns and lengthen the life of your conveyor belts and bucket elevator belts by using Flexco belt fasteners. Thousands of companies have stepped up the performance of conveyor lines and cut costs by using Flexco methods.

Bulletin F-100 shows exactly how to make tight butt joints in conveyor belts with Flexco. Also illustrates step by step the latest practice in repairing rips and putting in patches.

FLEXIBLE STEEL LACING CO.
4656 W. Lexington St., Chicago

Write for your copy.

FLEXCO H D BELT FASTENERS

Sold by supply houses everywhere

Light enough to handle . . heavy enough to "take it". These HIGHLY PORTABLE CMC's have proven their durability and sturdiness on important jobs all over the world. They are "first choice" Mixers in peace or war. All standard sizes. Get information.

CONSTRUCTION MACHINERY CO.
Waterloo, Iowa

Mixers . . . Pumps . . . Hoists . . . Batching and Placing Equipment . . . Saws . . . Electric Generating Plants

CLEVELANDS

FOR ASSURED . . . DEPENDABLE TRENCHING PERFORMANCE AT MINIMUM OPERATING AND MAINTENANCE COSTS

ON LONG and SHORT LINES for WATER . . . SEWER . . . GAS . . . TELEPHONE . . . OIL . . . POWER . . . DRAINAGE . . . FOUNDATIONS . . . AIRPORTS

Incorporating the engineering features that more than 25 years experience have proved most desirable CLEVELANDS have everything you'd ask for, for "Tops" in Trenching performance.

They're fast — amply powered — maneuverable — mobile — versatile — easy to operate — sturdily constructed — in fact they have just those features that enable you to make short work of the trenching jobs and show a profit.

THE CLEVELAND TRENCHER CO.

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Clean Corrections
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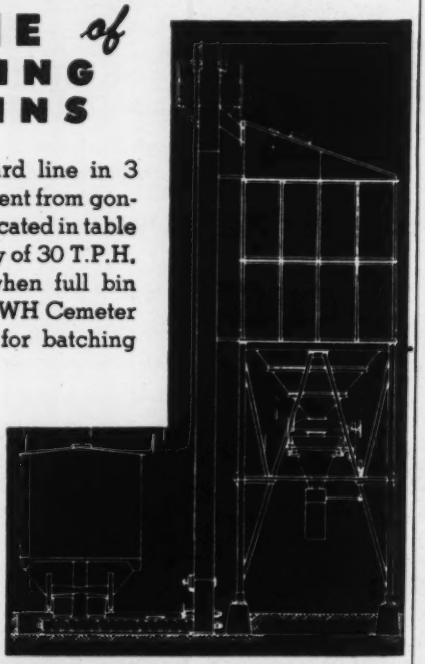
and keep drawings and all your office paper work clean —specify Erasers that bear the Quality name of EBERHARD FABER. On sale everywhere, for every use and for every kind of paper surface.
Pink Pearl
EBERHARD FABER

A NEW LINE of CAR LOADING CEMENT BINS

WE have developed this standard line in 3 popular sizes for hauling bulk cement from gondola cars to bin. Capacities are indicated in table below. Bucket elevator has capacity of 30 T.P.H. High level bin signal indicates when full bin capacity has been reached. Type DWH Cemeter provides 8 to 20 cu. ft. capacity for batching service. *Write for complete data.*



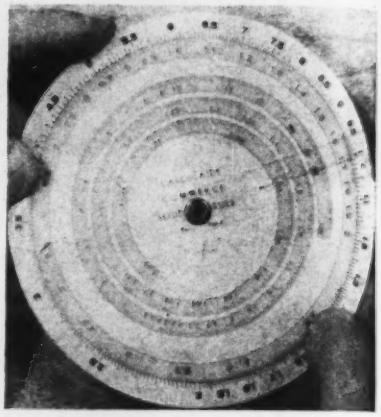
BIN	CAPACITY	
	CU. YDS.	BBLS
1	29	172 to 194
2	45	270 to 304
3	73	437 to 492

ERIE AGGREMETER PLANTS

Erie Steel Construction Co., 267 Geist Rd., Erie, Pa.

BUCKETS • AGGREMETERS • PORTABLE CONCRETE PLANTS

tank carriers for oxy-acetylene welding. The door to the tool chest in the rear becomes a convenient welding and work bench when opened. A Chrysler industrial 6-cylinder engine furnishes power for welding and transportation. Special cable reel has capacity for 75 feet of both electrode and ground cable and is optional equipment. Current supplied to the reel permits immediate welding at any desired cable length.—*The Hobart Brothers Co., Troy, Ohio.*



Circular Slide Rule—Pocket-size convenience is provided by 4½-in.-dia. circular slide rule. Most-used scales are located close to edge so each is actually 12½ in. long. Calculaide slide rule has C and D scales, plus log-log scale ranging from 1.01 to 100 which appears on inner spiral of almost three turns.—*American Hydromath Co., 145 W. 57th St., New York, N. Y.*

Waterproofing—Now available on a national scale, "Hydrozo" is a mineral preservative that is not affected by atmospheric conditions after application. This waterproofing compound, brushed or sprayed on, is said to thoroughly and permanently waterproof a wide range of surfaces. "Hydrozo" is a colorless liquid, about the consistency of turpentine; it can be used as a masonry paint by adding equal parts of Lithozinc paste. When color is wanted, paste colors may be added to the mixture.—*National Hydrozo Co., 5234 St. Clair Ave., Cleveland 3, Ohio.*

Hard-Surface Floor Covering—A hard-surface floor covering, Koroseal, is said to embody all of the qualities of durability, flame-resistance, colorability and resistance to wear and weather for which the raw material, Koroseal, is noted. It is a form of the familiar plasticized polyvinyl chloride, unsupported by any fabric, and is available in square flexible tile form and in a wide range of brilliant solid colors.—*Sloane-Blabon Corp., Trenton, N. J.*

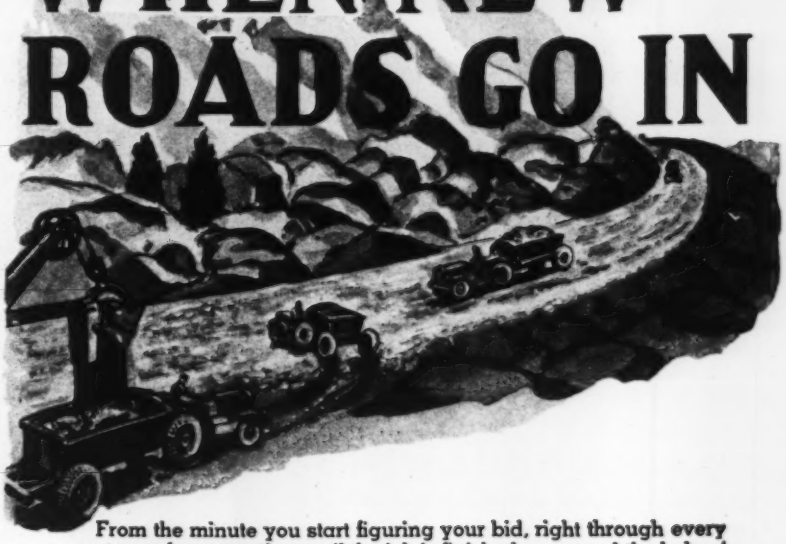
Men and Jobs

James A. Buchanan, capt., U. S. N., recently released after six years service, has been appointed assistant to the regional director, Region 5, Bureau of Reclamation, at Amarillo, Tex. Mr. Buchanan served with the Navy's Bureau of Aeronautics. His engineering career began in 1914 at the Panama Canal. He was later employed by the Washington municipal government, the International Boundary Survey, the Forest Service, the Coast and Geodetic Survey, and as an engineer for mining companies in Michigan.

Thomas L. Hightower, senior engineer with the U. S. Engineer Department, transferred recently from the Albuquerque District to the Mobile Engineer District to be assistant resident engineer on the construction of Allatoona Dam on the Etowah River near Cartersville, Ga. During the war he was a civilian employee of the Albuquerque Engineer District. After finishing at Arkansas A & M in 1927 Mr. Hightower worked for private engineers and the Arkansas Highway Department until the fall of 1931, when he went with the U. S. Engineer Department in the Memphis District at Cairo, Ill.

Graeme Reid, C. E., released as commander, C.E.C., U.S.N.R., will resume as consulting engineer, with temporary headquarters at Essex Falls, N. J. A branch office in Washington, D. C., is planned. Commander Reid joined the Navy in 1942 to take charge of motor vehicle transportation, then under the jurisdiction of the Civil Engineers Corps, Bureau of Yards and Docks. Later Mr, Reid was transferred to the contract division where he was in charge of the processing of more than 8,000 construction contracts. Prior to joining the Navy, Mr. Reid was traffic engineer for the Public Service Corporation of New Jersey and engineer in charge of highway transportation, New Jersey.

WHEN NEW ROADS GO IN



From the minute you start figuring your bid, right through every stage of construction until the job is finished, you need the help of

ASSOCIATED EQUIPMENT DISTRIBUTORS

ASSOCIATED EQUIPMENT DISTRIBUTORS — AED — MEMBER

These are the distributors who sell and service the machines you need to do the job, and make money. They are proud of their standing in the construction industry. You can rely upon machinery they offer. You can depend upon their integrity in any business transactions.

BUY SAFELY—
BUY FROM AN AED MEMBER

Small ROGERS TRAILERS too-
with ✓BIG 3 PERFORMANCE

✓LOADABILITY
✓HAULABILITY ✓BRAKEABILITY

. Yes and Up To 600 TONS capacity IF YOUR JOB REQUIRES IT

Hauling of heavy equipment is a business requiring *special* equipment for best results.

While most Rogers Trailers sold are of the multi-wheel type and of large capacity, a line of smaller trailers is also manufactured.

These trailers, too, embody the knowledge gained through several decades of exclusive activity in trailer building.

Purchasers get — LOADABILITY — or facilities for easy loading; HAULABILITY — or proper load distribution and ability to carry heavy load rapidly — and BRAKEABILITY — or equipment to assure safe control of heavy loads under all conditions.

Get the Rogers Catalog and buy a Rogers Trailer to be assured of utmost durability and performance.

ROGERS BROTHERS CORPORATION
135 Orchard Street • Albion, Penna.

ROGERS TRAILERS
EXPERIENCE *builds 'em* • PERFORMANCE *sells 'em*

. **Frank W. Charlesworth,** city engineer at Kaukauna, Wis. has resigned and will be associated with Hoth & Porath, consulting municipal and airport engineers at Green Bay, Wis.

W. T. Britten, resident U. S. Engineer at Escanaba, Mich., during the ore dock project and stationed since then at Fort Custer and Milwaukee, has resigned. He plans to enter the contracting business in Escanaba.

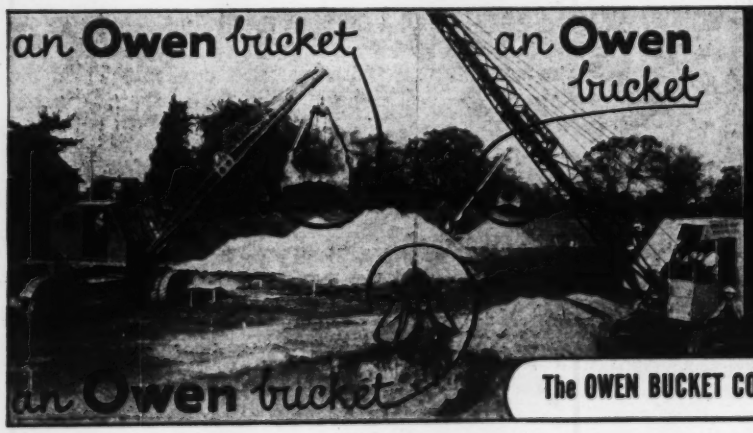
Col. George W. Gillette has been designated acting division engineer for the South Atlantic Division, Army Engineers, replacing Brig. Gen. J. B. Newman, who is on leave. Colonel Gillette has been district engineer at Wilmington, N. C.

Ray R. Best, of Tulelake, Calif., has been appointed district engineer of the newly created Klamath District of Region II, U. S. Bureau of Reclamation. The district will take in the counties of Del Norte, Siskiyou, Trinity, Humbolt, Modoc and part of Mendocino in California and Klamath Co., and the Smith River watershed of Curry and Josephine counties in Oregon. The district office will open soon in Klamath Falls, Ore.

Robert R. Ellis, Jr., has been transferred from manager of the Lima, Peru, office of the Frederick Snare Corp. to the managership of the company's activities in Venezuela with headquarters in Caracas.

Carl M. Hoskinson, chief engineer of the Sacramento, Calif., water department, has been appointed to the combined post of superintendent and chief engineer by Sacramento City Manager Bartley W. Cavanaugh. He succeeds **Brig. Gen. Richard E. Mittelstaedt,** who resigned to become a members of the state railroad commission.

Hoskinson has been with the department since 1921 and worked pre-

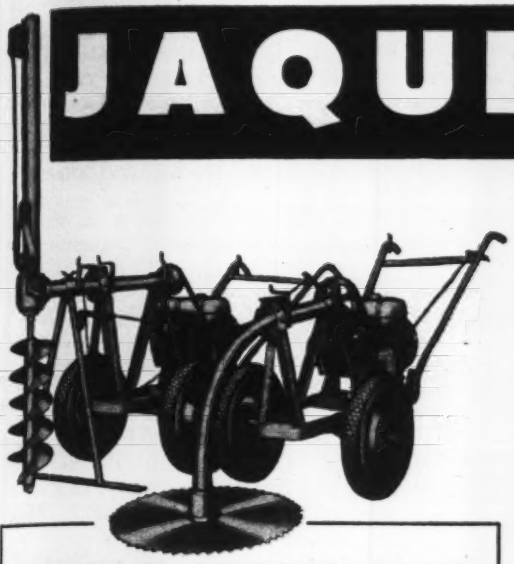


Three Owen Buckets that we can see are at work on this particular project.
Multiply this by a very large number and you'll get a partial conception of the widespread Owen standardization on the part of progressive contractors everywhere.
There is a new Catalog available now. You'll want to consult it we're certain. A brief line to us will bring your copy to you promptly.

A MOUTHFUL AT EVERY BITE

The OWEN BUCKET CO. 6010 BREAKWATER AVE. CLEVELAND, OHIO BRANCHES: New York, Philadelphia Chicago, Berkeley, Calif.

JAQUES LABOR SAVING MACHINES



Do the Job QUICKER • BETTER

If it's a big job like constructing a telephone, power line, or drilling foundation holes, THE JAQUES HYDRAULICALLY CONTROLLED EARTH BORING MACHINE below will do the job faster, easier, and better—at a saving in time, manpower, and cost. Note some of its principal features:

1. ALL PLUMBING is hydraulically controlled, enabling faster operation and transportation from hole to hole as machine can be instantly lowered to traveling position, and again quickly placed in operating position regardless of the unevenness of the terrain.
2. FASTER DRILLING, as the hydraulic feed maintains a constant pressure on the bit maintaining the maximum R.P.M.'s on the auger without the slipping of any clutch or gears. The texture of soil controls the rate of digging.
3. HYDRAULIC PRESSURE on bit transmits less shock to machine while digging in rock or other hard-to-drill soils.
4. HYDRAULIC FINGERTIP CONTROL reduces operator fatigue to a minimum.
5. ONE MAN easily operates this machine as all controls are conveniently located.
6. PEAK OPERATING maintained hour after hour with these simple trouble-free hydraulic controls.
7. HOLES CAN EASILY be drilled at any angle.

ENGINE—Industrial Type Gasoline, approximately 30 h.p. S.A.E. Rating, with starter, generator, and battery. UNIT—mounted on steel-I-beam skids (Easily attached to or removed from truck or other conveyance). DRIVE—MECHANICAL—four forward speeds and one reverse. FEED—HYDRAULIC. LIFT—HYDRAULIC. LEVELING—HYDRAULIC. HOLE SIZE—Up to and including 24 inches. (Larger diameter on special order). DEPTH OF HOLE—8 to 9 feet with standard machine (greater depth on special order). WEIGHT—Approximately 3900 pounds. WIDTH—4 feet, 3 inches; LENGTH—10 feet.

JAQUES JR. POST-HOLE DIGGER

HOLE DIGGING is easy, fast, economical and efficient with the JAQUES JUNIOR POST-HOLE DIGGER. In ordinary ground, it bores 9" hole three feet deep in sixty seconds or less. Can be operated by one man. Throws dirt out leaving hole clean. Complete, F.O.B., Denison . . .

$398.00

JAQUES JR. PORTABLE POWER SAW

It's easy to clear land of brush and trees, with a JAQUES JUNIOR PORTABLE POWER SAW. Its 30" unbreakable saw, powered by 5 to 6 h.p. engine zips through brush and trees in seconds, cutting them off level with ground. Once tree is felled, angle of saw can be changed quickly to trim and cut tree to any desired length. Price of saw, complete, F.O.B., Denison, is only . . .

$379.50

SAVE $200 ON COMBINATION

If you prefer, you can buy the SAW complete with frame and engine for $379.50 and the Post-Hole Digger attachment, which is interchangeable with saw, for $198.00 extra. Switch from Saw to Post-Hole Digger can be made in about five minutes.

TRACTOR MOUNTED SAW

For the bigger clearing jobs inquire about the JAQUES TRACTOR MOUNTED SAWS.

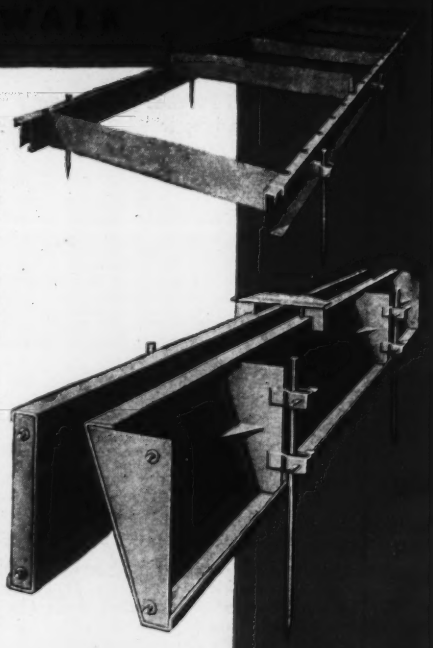
JAQUES POWER SAW CO.

Highway 75 Denison, Texas

HOW TO

improve appearance and save money

ON CONCRETE CURB, GUTTER AND SIDEWALK



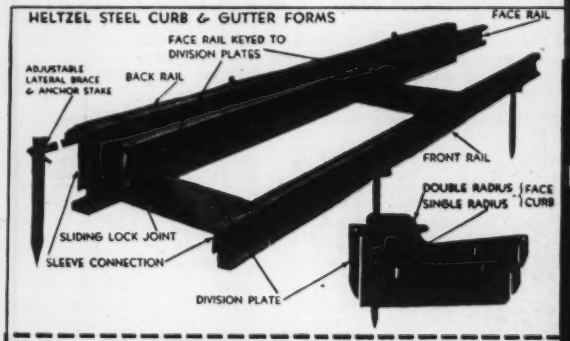
You buy Heltzel Steel Forms once. They stay in service for 20 years or more and each job you set is as uniform as the ones before. The low cost of the equipment per year of service plus the benefits of faster work with the use of forms net substantial savings.

Rigid, self-interlocking Heltzel Steel Forms make the setting and stripping job much easier and faster. No warping, no chipping, no replacements.

Heltzel has been engineering steel forms for 36 years. No matter how complicated or individual your specifications, we can furnish forms for your work.

Purchase of Heltzel Steel Forms for municipal sidewalks, gutters, and curbs enables cities and towns to establish a sound employment program. No other method for setting concrete offers so many advantages.

Write today for engineering data Bulletin A-20-F on Heltzel Steel Forms.



Send me catalog A-20-F
"Steel Forms for Building Concrete Curbs, Curb and Gutters, or Sidewalks"

Name_____

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(Type of construction usually engaged in)

Heltzel
BUILDS IT BETTER

BINS (Portable and Stationary)
CEMENT BINS (Portable and Stationary)
CENTRAL MIXING PLANTS
BATCHERS (for batch trucks or truck mixers with automatic dial or beam scale)
BITUMINOUS PAVING FORMS
ROAD FORMS (with lip curb and integral curb attach ments)
CURB FORMS
CURB AND GUTTER FORMS
SIDEWALK FORMS
SEWER AND TUNNEL FORMS
CONCRETE BUCKETS
SUBGRADE TESTERS
SUBGRADE PLANERS
TOOL BOXES
FINISHING TOOLS FOR CONCRETE ROADS

HELTZEL STEEL FORM & IRON CO.
WARREN, OHIO · U. S. A.

viously with the engineering staff which designed the city's filtration plant. Following his graduation from Stanford University in 1909, he spent four years with the Great Western Power Co. in Sacramento, San Francisco and on the Feather River. He later was attached to the Bureau of Reclamation in Phoenix. He served in France in World War I with the Corps of Engineers.

A. J. Armstrong, recenty project engineer in the design branch, U. S. Engineer office, Pittsburgh, Pa., is now in the special engineering division of the Panama Canal.

Frank L. Raschig, Cincinnati, has been reappointed Ohio Director of Public Works by Gov. Frank J. Lausche, for a term to end Jan. 1, 1947.

Capt. Henry L. Jacques, head of the major construction division of the Los Angeles Water and Power Department, has retired after 34 years of service. Born in France, Mr. Jacques was graduated from the Colorado School of Mines and began with the Los Angeles department in 1910 as a chainman on the Los Angeles Aqueduct Project. He was commissioned captain in World War I and assigned to the 27th Engineers. He was named head of the major construction division on his return from service in 1919. The two largest jobs with which he was connected besides the Aqueduct were Bouquet Dam and the Mono Basin projects.

J. Spencer Ross is field engineer in the city engineering office of Harrisburg, Pa.

Guy B. Panero, engineer recently cited by the War Department for a special mission investigating new chemical processes in Germany, has purchased the firm of Clyde R. Place, consulting engineers, Graybar Bldg., New York City, and is now directing the organization under the name, Guy B. Panero, Successor to Clyde R. Place, Consulting Engineers.

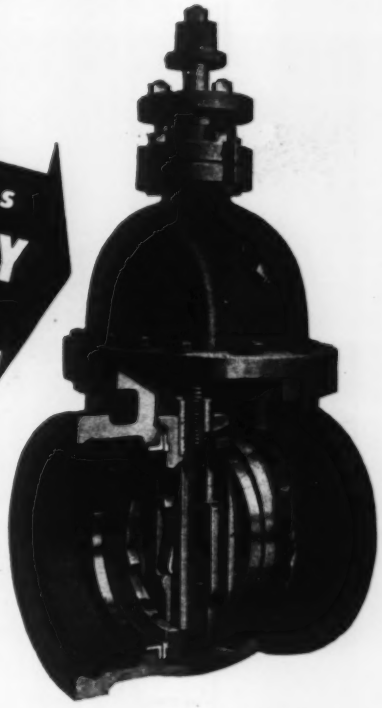
John W. Beatty, city planning engineer at Waukesha, Wis., has resigned to take a similar position at Racine, Wis.

C. N. Teaff, director of public works and utilities at Hamilton, Ohio, for 18 years, and acting city manager since March, has been named city manager.

Every feature you want in an

AWWA STANDARD WATER GATE VALVE

is in this KENNEDY DESIGN



The many thousands of installations of Kennedy AWWA Standard Water Gates in municipal pumping stations and water supply pipe lines all over the country have firmly established the reputation of the Kennedy design for thoroughly dependable operation, extra-long service life, and exceptionally low maintenance expense.

These valves exceed AWWA requirements in many particulars, and have extra values at no extra cost, making them the best possible investment for your community. They are built in a complete range of sizes up to 60-in., with any desired type of pipe line connection, may be furnished for direct manual operation or with gearing, cylinder or electric control, and with a wide range of accessories such as by-pass, indicator, clean-out, square bottom, grease seal, etc.

Write for the 240-page Kennedy Catalog, describing these valves in detail, together with high pressure valves for fire protection systems, special sewage valves, the widely used Kennedy Safetop and Standard fire hydrants, and the complete line of Kennedy valves and pipe fittings for all standard requirements.

YOU WANT THESE VALVE FEATURES
. . . you'll find them in this KENNEDY design

1. **Generous Strength . . .** Body and bonnet are of high-grade dense metal with ample thickness and rounded fillets. Stem has large diameter and extra large number of contact threads.
2. **Easy Operation . . .** Stem and stem contact surfaces are accurately threaded. Deep stuffing boxes permit tightness without undue pressure on packing. Large handwheel gives firm, comfortable grip.
3. **Lasting Tightness . . .** Discs and seats seat accurately, and their sturdy design resists distortion and has special provisions for take-up of wear.
4. **Long Life . . .** Many Kennedy valves have been in daily use a quarter century and more.
5. **Convenient Repacking . . .** Glands and packing are easily accessible.
6. **Economical Maintenance . . .** Long wear built into all parts, and adjustments or other attention are seldom required.

THE KENNEDY VALVE MFG. CO.
Elmira, New York

KV-133

KENNEDY *valves - pipe fittings - fire hydrants*

THIS STEEL WATER PIPE does not crack under pressure*

...nor from shock, soil shifts or temperature changes in normal waterworks service

For full information and prices on ARMCO Spiral Welded Steel Pipe, address Armco Drainage & Metal Products, Inc., Welded Pipe Sales Division, 1675 Curtis Street, Middletown, Ohio.

Export: The Armco International Corporation

*Ultimate strength, 50,000-60,000 psi.; yield strength, 30,000-40,000 psi.; elongation in 2 inches, 30%.

ARMCO

ARMCO STEEL PIPE

Gerald W. Fling, Fostoria, Ohio, former Seneca County engineer, has received orders for duty as a captain with the U. S. Army Corps of Engineers at Fort Belvoir, Va. He served 39 months during the war.

John L. Mason, comdr. CEC, USNR, has returned to civilian life and is now associated with the engineering office of Clyde C. Kennedy in San Francisco. He served in the Navy in the Bureau of Yards and Docks, Washington; as contract superintendent, 5th Naval District; and as executive officer, Public Works Department, Naval Shipyard, Mare Island, Calif. Mr. Mason specialized in prestressed concrete construction for 10 years prior to entering the Navy in 1941.

Clyde P. Nicholson has been appointed supervising engineer of Virginia Beach, Va. He was assistant chief of engineering for the Norfolk Southern Railway before he went overseas. In 1945 he was adviser on transportation to the American Embassy, Paris, preparing Lend-Lease lists of equipment needed for the reconversion of French railroads, harbors and towns.

James C. Causey, Jr., an engineering graduate of Virginia Military Institute who has been engineer and city manager of Suffolk, Va., sixteen years, has resigned to join the Norfolk engineering firm headed by M. A. Sturgeon.

J. S. Allen, Greenville, Miss., chief engineer for the Mississippi Levee Commission for 24 years, has been retired at his own request, and is succeeded by **W. E. Elam,** formerly assistant engineer. Renamed assistant engineers were **W. C. Beanland** and **R. N. Middleton.**

Ernest Smith has been named divisional engineer, Department of Public Works, Victoria, B. C. He succeeds Owen W. Smith, retired.

W. O. Baxter is the new engineer of Marion County, Fla.

L. C. Macabee has resigned as engineer of Los Gatos, Calif.

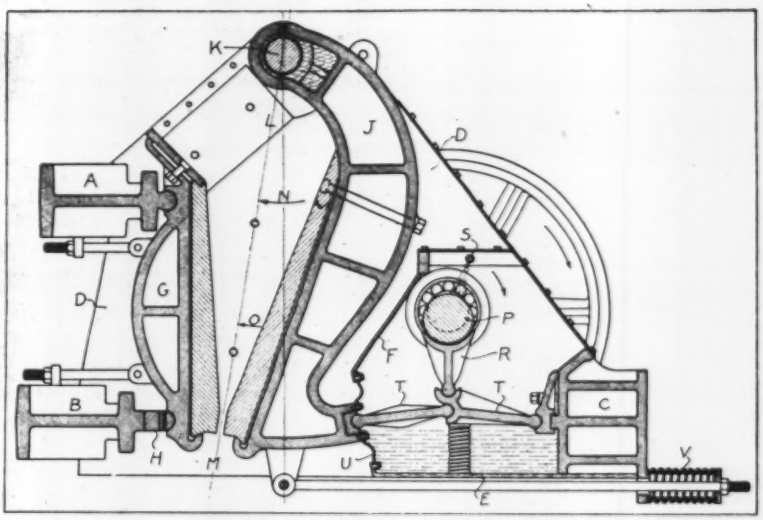
R. S. Pennebaker of Crane has been named city engineer and superintendent of the municipal power, water and sewer department of Denton, Tex., succeeding **L. R. Burrow,** who will become city manager at Raymondville.

Lt. Col. William J. Ellison, on leave after duty at the Army Engineer replacement pool at Fort Belvoir, Va., has been assigned to the Portland, Ore., district. He will report for duty late in September and will be stationed at Umatilla, Ore.

KUE-KEN*
SIMPLEX
CRUSHERS

Experienced engineers and operators have frequently said that real and worthwhile improvements in jaw crushers have long been overdue. Such improvements are incorporated in the Simplex crusher.

The outstanding advantages of the Kue-Ken principle of "crushing without rubbing", proved in numerous installations of our double jaw crushers, are now available to users of this single jaw Simplex crusher. The most difficult primary crushing requirements of mine, quarry and industrial operators are easily met by this simple and powerful machine. Your careful consideration of the following description is respectfully invited.



Sectional view of the Kue-Ken Simplex crusher

By referring to the above sectional view, it will be seen that the heavy steel side frame plates D are rigidly tied together by the steel cross members A, B and C, with the plates E and F forming a large oil bath and storage tank. The normally stationary jaw G is held firmly against the front cross members. The flat steel bars or spacer shims H are easily removed or installed, thus controlling the size of the crushed product, and without disturbing the geometry of the crushing motion.

The massive swing jaw J hangs freely on the large hinge pin K, which is firmly secured in the frame. Oil bath lubrication, completely flooding the bearings and thrust faces, with an exclusive type of positive seal, is provided at this important point. Note particularly the location of the hinge pin on the line LM, which passes through the **center** of the crushing zone. It is clear that the jaw motion must follow the arrows N & O, so that the rock is **nipped** and **crushed squarely**, with minimum slippage and rubbing, and therefore with the least possible wear of jaw plates and power. Compare this logical design with the adjacent illustrations of the ordinary "Blake type" and overhead eccentric" crushers, in which the jaw movement also follows the arrows.

"Blake" Type Crusher

Overhead Eccentric Type

Every operator knows of the excessive slipping, jaw plate wear and high power requirements of these old-style machines. This is as would be expected of machines designed more than fifty years ago, yet still offered for sale as "modern equipment"! Jaw plates in "Simplex" crushers, crushing hard, abrasive material will last several times longer than in any other crusher operating under the same conditions. This means lower crushing costs to all Simplex owners, and a minimum of contamination of the material by metal from the jaw plates, frequently a very important matter in some industrial and metallurgical operations.

The mechanism to operate the swing jaw of the Simplex crusher is strikingly simple. First, there is the massive eccentric shaft P mounted in two giant self-aligning roller bearings pressed into the steel side frames. This shaft has an exceptionally long "throw" on the eccentric, permitting the two toggles T and T to be set in the most desirable and relatively flat position. You will readily appreciate that shaft and pitman bearing pressures are in direct ratio to the eccentric stroke and swing jaw travel.** Note that the toggles are inverted, as compared to the old-style Blake machine before mentioned, and impart the crushing stroke to the swinging jaw when **pressed down** by the pitman R. This pitman is a simple, light and strong steel member always in compression, with the upper end bearing against the **lower side only** of the eccentric shaft. The lower end of the pitman rests in a groove formed on top of the rear toggle, and does **not** pass through or between the toggles. Old-style Blake crushers operate with the pitman in tension during the crushing stroke, and with the lower end trapped **between** the ends of the toggles and thus subjected to the entire severe crushing stress, and the even more destructive bending forces. Our design eliminates the usual heavy pitman bearing caps, bolts, shims and water jackets, and avoids harmful friction. Our small and simple pitman is about one-tenth the weight of others, so that we can use a long stroke eccentric and flatter toggles to get greater leverage combined with low pressures on shaft and pitman bearings. These features, with abundant lubrication by both pump and splash systems, permit high speed operation, so that Simplex crushers run cool at 350 to 400 crushing strokes per minute, or 50 to 60% faster than old-style crushers. More crushing strokes per minute mean greater capacity and more evenly crushed rock. An oil resistant flexible diaphragm U seals the opening in the oil bath, yet permits free movement of the toggles and swing jaw. A large and readily removable steel door covers the sloping rear of the crusher, permitting easy access to the mechanism. The Simplex mechanism automatically compensates itself for wear, slight as this may be, due to the pull-back spring V keeping all parts snugly together. The high speed of the shaft, plus the great leverage given by the long stroke and relatively flat toggles, does away with need for the two ponderous flywheels used on other crushers. Instead, the Simplex crusher has only one relatively small and lightweight driving pulley located close to the frame bearing.

To protect the crusher against "tramp iron" or any severe overload, this pulley is not fastened to the shaft, but drives through an overload safety device built into the hub. The experienced operator does not have to be told how important this is—the broken frames, pitmans, toggles, shafts and flywheels of old-style crushers are mute but eloquent testimony. Simplex crushers are of all-steel construction, manganese steel fitted, and built to extremely high standards of precision. Details on the sealed oil bath lubrication system will follow soon.

* Pronounced Q-KEN

** Blake type crushers invariably suffer from high bearing pressures, and the overhead eccentric type is even worse.

At the present time the KUE-KEN SIMPLEX is offered in three sizes: 30" x 15", 36" x 20", 42" x 25"

STRAUB MFG. CO., INC.

530 CHESTNUT ST.,

OAKLAND 7, CALIFORNIA

Leupold Builder's Level

for

Engineers
Architects
Contractors

L&S

You'll search a long time to find an instrument comparable to this Leupold product. Men who use it confirm our belief that all requirements are conveniently incorporated in this one accurate, moderately priced level.

Telescope is external focusing, 13 inches long, with 1¼ inch objective; achromatic lens with a flat field and magnification of 18 diameters . . . Horizontal circle for turning angles and two auxiliary standards to which the telescope may be shifted for plumbing vertical lines . . . Instrument weight—8 lbs. Tripod weight—7 lbs . . . Hardwood carrying case.

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Manufacturers since 1907
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Elections and Activities

William Hackney has been elected president of the Kern County, Calif., Contractors' Association. Other officers are: Cecil Jones, vice-president; and Wilson Knight, secretary-treasurer.

William H. Mills, of St. Petersburg, Fla., has been elected president of the St. Petersburg General Contractors' Association. Other officers include: Clyde Keys, first vice-president; Robert B. Brown, second vice-president; James Wilson, third vice-president, and Hubert Birk, secretary-treasurer.

Prof. T. C. Shedd, of the department of civil engineering, University of Illinois, was principal speaker at a recent meeting of the University of Illinois chapter of the American Society of Civil Engineers.

P. D. Christian, Jr., partner in the firm of Christian & Bell Co., was elected president of the Georgia branch, Associated General Contractors of America. Other officers include: E. K. Van Winkle, Ira H. Hardin, Merrill W. Newbanks, and A. J. Collins.

At the sixth annual meeting of the Westchester Water Works Conference, at Geenburgh, N. Y., the following were designated as members of the board of directors for the next three years: Arthur L. Richards, Larchmont; Charles Dedde, New Castle; and James M. Fitz-Gibbons, Yonkers.

Recently organized at Red Wing, Minn., is the Red Wing Technical Society, including all professional engineers, chemists and surveyors in the area. Chairman of the new group is T. E. Carey; vice chairman is N. Clifford Benrud, and secretary-treasurer is Willard E. McCreary.

New officers of the Northern Section, Illinois Sewage Works Operators, are: Donald Henn, DeKalb, chairman; Clarence Hill, Dixon, vice chairman; and David R. Miller, sanitary engineer of the Great Lakes Naval Training Center, secretary.

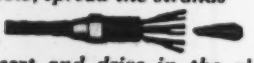
Robert McC. Figg, Jr., of Charleston, general counsel for the South Carolina State Ports Authority, discussed the legal and physical organization of the authority in an address at an annual summer convention of the South Carolina Society of Engineers.

GOES ON IN NO TIME

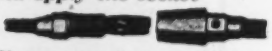
HANGS ON FOR ALL TIME

. . . this Electroline FIEGE
WIRE ROPE CONNECTOR

See how easily it goes on—simply slide the sleeve on the cable, spread the strands



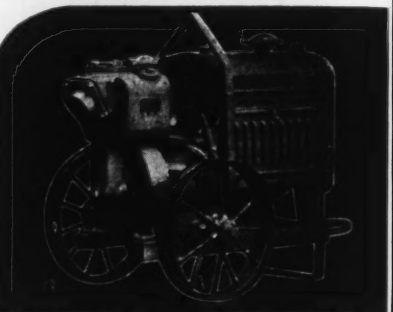
insert and drive in the plug and apply the socket



Then see what a solid and permanent joint you have by looking at it through the inspection hole put there for the purpose.

This better connector damps vibration, prolongs wire rope life; is in fact the STRONGEST PART of a wire rope assembly.

Electroline Company
4121 SOUTH LASALLE STREET
CHICAGO 9, ILLINOIS



SIMPLE - STURDY *and* ECONOMICAL

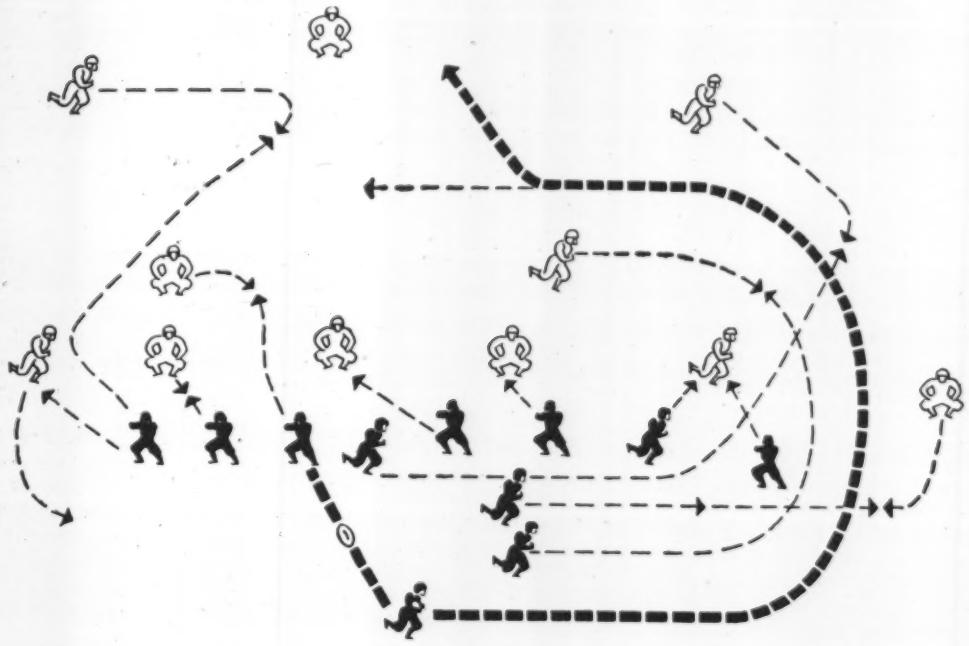
Gorman-Rupp centrifugal pumps will save time and money on any pumping job. Their simplicity of design and rugged construction insures trouble free performance. They will pump as much or more water for more continuous hours than any pump on the market. Your nearest distributor will assist you in choosing a Gorman-Rupp pump to fill any requirement.

Order a Gorman-Rupp self-priming, centrifugal pump from your distributor, put it on the job for thirty days. If it isn't the best pump you ever used we will take it back and it won't cost you a cent.

THE GORMAN-RUPP Mansfield, Ohio

GORMAN-RUPP
Self-Priming Centrifugal Pumps

In a **ROCKMASTER** Blast . . . In an Off-Tackle Play . . . Precise "TIMING" Pays Off



A winning football play depends on precision timing. The play can be shifted to suit circumstances. It "pays off" with touchdowns.

The precision split-second timing of the new Atlas Rockmaster Blasting System has "paid off" hundreds of users in terms of greatly increased fragmentation, saving dollars through stepped-up shovel efficiency and cutting down on secondary blasting. Furthermore, in many cases it has eliminated complaints about noise and vibration from blasting, even when more holes have been fired by the Rockmaster System. It has helped cut down "backbreak" in quarries and open-pit mining, and saved much of the expense of secondary shooting on the grizzly in underground operations.

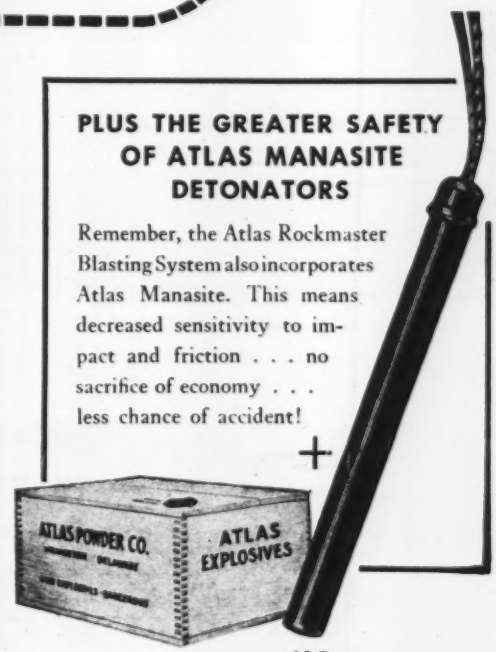
The Rockmaster Blasting System, like the football coach's favorite play, is shifted to suit circumstances. All factors in a Rockmaster blast—timing, loading, detonators, explosive and "know-how"—will adapt the system to your own particular job.

The wise football coach knows that the off-tackle play is not the answer to every situation. Likewise, Atlas does not claim that Rockmaster is the answer to every blasting problem. Yet Rockmaster may be able to achieve the same outstanding results for you as it has for many others. For an honest opinion of what Rockmaster can do for you, consult the Atlas Representative.

PLUS THE GREATER SAFETY OF ATLAS MANASITE DETONATORS

Remember, the Atlas Rockmaster Blasting System also incorporates Atlas Manasite. This means decreased sensitivity to impact and friction . . . no sacrifice of economy . . . less chance of accident!

+



"ROCKMASTER"—Trade Mark
Manasite: Reg. U. S. Pat. Off.

ATLAS EXPLOSIVES *"Everything for Blasting"*

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington 99, Del. • *Offices in principal cities* • *Cable Address—Atpowco*

A Leading Editorial
FROM
ENGINEERING NEWS-RECORD

Venturi and Herschel

THIS YEAR is the 200th anniversary of the birth of the Italian hydraulician, Giovanni Battista Venturi. Among other things, he formulated the important principle that fluids under pressure, in passing through converging pipes gain speed and lose head, and vice versa for diverging pipes. We remember and applaud this scientific contribution of Venturi. But in doing so we must likewise give equal recognition to a great American engineer without whose efforts the name of Venturi would have been buried in oblivion. It was Clemens Herschel who in 1887 invented a measuring device that provided a practical application of Venturi's natural law, thus providing the world with a flow instrument that has no peer for simplicity, accuracy and ruggedness. "Out of respect for Venturi's experiments," wrote Mr. Herschel, the device was named the Venturi meter. Thus with a display of self-effacement that is rare Mr. Herschel coupled the name of a long-forgotten engineer with his invention and gave credit to the man who had pointed the way. Few men are endowed with the mental sagacity of a Herschel, but all might emulate his generous spirit; to be niggard in sharing credit for professional achievements shows lack of character without which an engineer cannot truly discharge his complete responsibilities. Thus in honoring Venturi we find good reason to pay double homage to Herschel whose engineering contributions were second only to his respect for the efforts of others.

June 27, 1946 • ENGINEERING NEWS RECORD

BUILDERS-PROVIDENCE, INC.
(Division of Builders Iron Foundry)
51 CODDING STREET, PROVIDENCE 1, RHODE ISLAND
Builders of the VENTURI METER
Ever Since Herschel's Invention
WRITE FOR DESCRIPTIVE
BULLETINS OF LATEST DESIGNS

BUILDERS PROVIDENCE
Instruments

Manufacturers' Activities

A. L. BERGSTROM, vice president, in charge of engineering, Timken Roller Bearing Co., Canton, Ohio, is one of 21 American engineers and industrialists invited to inspect industrial plants and research laboratories in Sweden, Norway and Denmark.

CHARLES A. FLANNERY, former colonel, Corps of Engineers, has joined the Joshua Hendy Iron Works, Sunnyvale and Torrance, Calif., as manager of general products sales. Mr. Flannery will supervise sales of hydraulic and mining equipment, valves, gears and all kinds of special custom-built machinery.

Clifford A. Patch has been appointed sales manager, Western division of Joshua Hendy Iron Works, succeeding Clarence Jensky. He will supervise sales of all products made at the company's Sunnyvale and Torrance, Calif. plants.

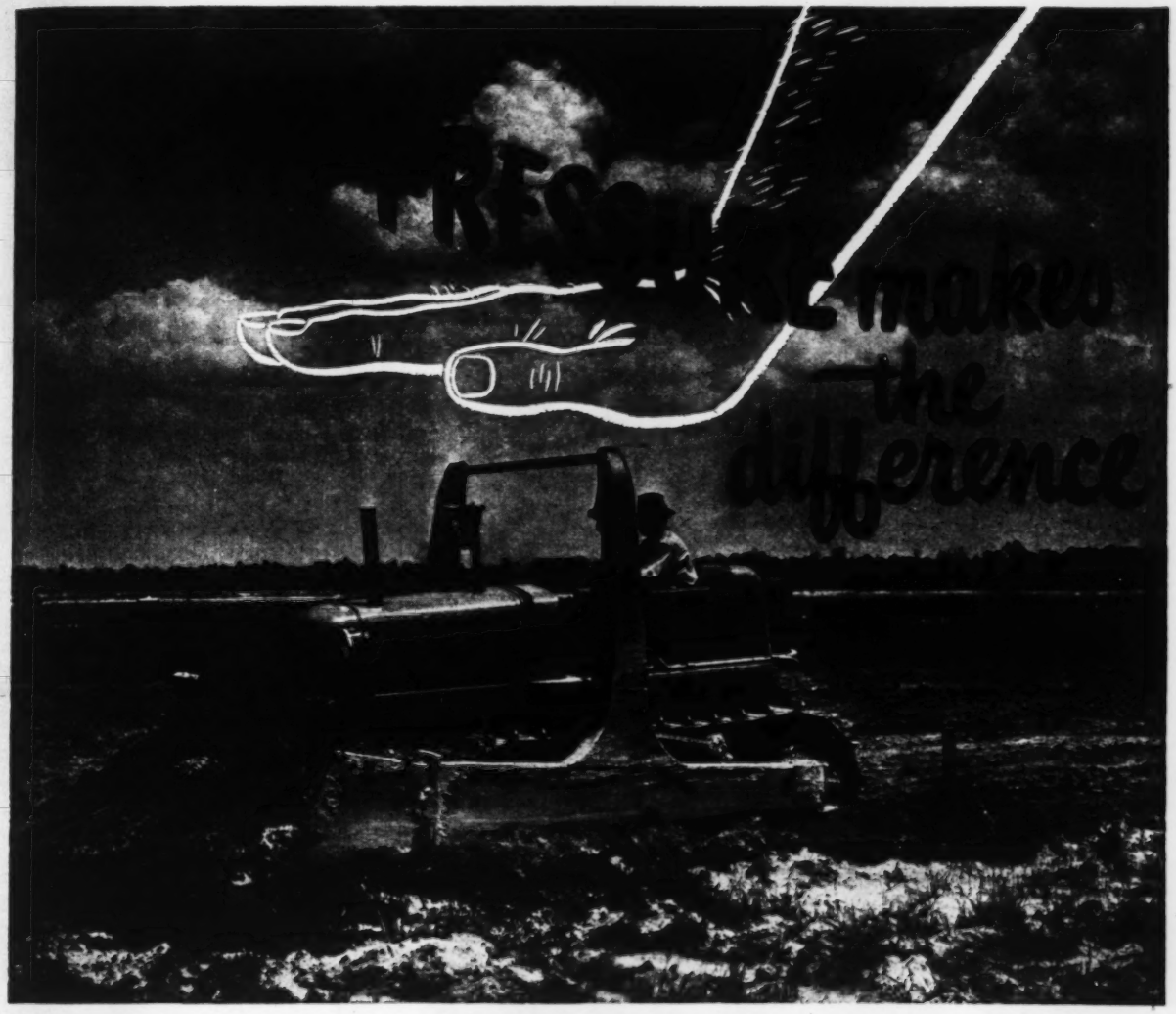
THE ALLEGHENY LUDLUM STEEL CORPORATION announces the relocation of its executive offices in the Oliver Building, Pittsburgh 22, Pa.

Smith W. Storey of Chicago, president of Consolidated Cement Corp., has been elected to succeed the late John L. Senior as president of Florida Portland Cement Co., Signal Mountain Cement Co., and Trinity Portland Cement Co. Mr. Storey has served as executive vice-president of these companies which have plants in Michigan, Kansas, Florida, Tennessee and Texas. Howard Miller, also of Chicago, secretary-treasurer of Consolidated Cement Corp. becomes vice-president and treasurer of the other three companies.

E. E. CHAUDOIN has been named Far Eastern representative for the Caterpillar Tractor Co., Peoria, Ill. He will make his headquarters in Manila, P. I., with his territory extending from Manchuria to Netherlands East Indies.

APPOINTMENT OF W. N. REMSBURG as chief engineer of the Sanitary Division of the American Well Works, Aurora, Ill., has been announced. Gerald E. Hauer has been added to the sanitary division staff of the company.

E. C. LOW, vice-president in charge of sales, John A. Roebling's Sons Co., Trenton, N. J., announces the promotion of Forest S. Burtch to manager of sales, wire rope division, and William Hobbs,



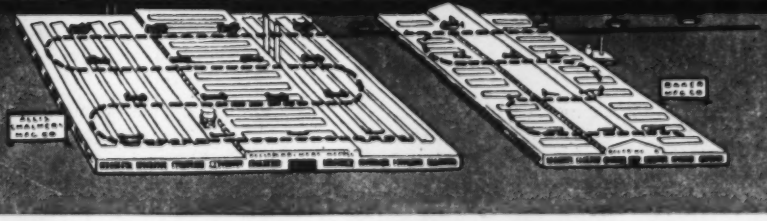
BAKER

Watch a Baker 'dozer in action, as it smashes through the "toughest going"— digs in and rolls out more yardage than any other 'dozer on the job. Powerful hydraulic *Down Pressure* on the cutting edge makes the difference. The blade sinks in, bites through stubborn earth — moves more yardage with fewer passes — yet the operator "takes it easy."

Baker *Down Pressure* is one big reason why more and more users are standardizing on Baker Bulldozers and Gradebuilders; why there are more Bakers on Allis-Chalmers Tractors than all other makes combined.

BAKER MFG. CO., SPRINGFIELD, ILL.

"STRAIGHT THROUGH" ASSEMBLY LINE – ALLIS-CHALMERS TO BAKER TO YOU!



The modern Baker plant with its completely equipped fabricating, machining and blacksmithing shops adjoins the Allis-Chalmers crawler tractor plant. When you order an A-C tractor with Baker bulldozer or gradebuilder, your tractor leaves the A-C assembly line, crosses a narrow road and goes on the Baker final assembly line.

FOR PROPORTIONING CHEMICALS IN SOLUTION AT CONSTANT, MANUALLY ADJUSTABLE, RATES

All %Proportioneers% Diaphragm Chemical Pumps are equipped with "See-Thru" plastic reagent heads and successfully handle any chemical used in the waterworks field. Over 20,000 %Proportioneers% are providing precise, dependable chemical feeding in many parts of the world.

% PROPORTIONEERS, INC. %
92 CODDING ST., PROVIDENCE 1, R. I.

Shunk
GRADER AND SCARIFIER BLADES

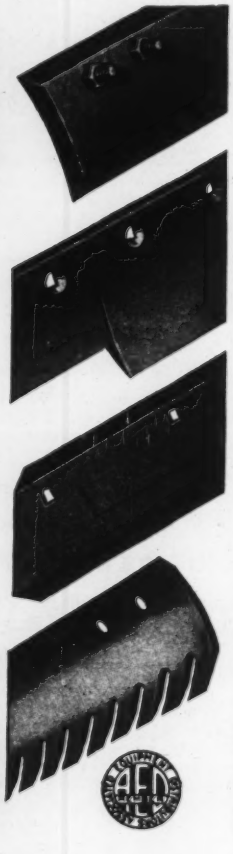
For any type or make of machine—Motor Graders, Maintainers, Scrapers, Drags, Bulldozers, Backfillers, Wagon Scrapers, Trail Builders, Trail Blazers, Carryalls, Snow Plows. Also—CUTTING EDGES, WEARING BOOTS, BACK SLOPERS, EXTENSION BLADES, MOLDBOARDS and SCARIFIER TEETH

50 years of specializing in the manufacture of Construction Equipment Blades has developed for your benefit a quality of special steel, milled through our own rolls and forged at the edges to give that extra cutting and wearing quality you need.

Furnished in various widths, lengths, and thicknesses, punched ready to fit your machine.

Consult your internationally recognized Blade Specialists. Write for special bulletins, giving type and name of machines you operate—get set for Blades early.

Shunk
MANUFACTURING COMPANY
Established 1854
BUCYRUS, OHIO



Jr., to manager of sales, aircord division.

THE NEW DANVILLE, ILL., PLANT of the Hyster Co. is now producing lift trucks and is expected to be in full production by fall.

BARBER-GREENE, Co., Aurora, Ill., announces the appointment of new distributors in Texas and Louisiana, as follows: Texas: Overton & Ross, 2701 Main St., Dallas; Cochran Equipment Co., 200 Portwood St., Houston; Engineered Sales, 222 North Drive, San Antonio; Fred Berryhill Eqpt. Co., 710 "Q" Ave., Lubbock; Contractors Eqpt. & Supply Co., 1420 Myrtle St., El Paso. New Mexico: Contractors Eqpt. & Supply Co., Springer Bldg., Albuquerque. Colorado: Ray Corson Machinery Co., 1600-15th St., Denver. Louisiana: Southern Eqpt. & Tractor Co., Monroe and Baton Rouge. Kansas, Oklahoma and Western Missouri: Paul L. Matchette Co., Railway Exchange Bldg., Kansas City, Mo.

In addition, Barber-Greene maintains Area Sales and Service, with headquarters at 835 Irwin-Keasler Bldg., Dallas.

APPOINTMENT OF WABASH EQUIPMENT & SUPPLY CO., Indianapolis, Ind., as distributor of Davey compressors, was announced recently by Paul H. Davey, president, Davey Compressor Co. Wabash will offer complete sales and service facilities on all items of Davey manufacture.

A NEW DISTRICT OFFICE will be established in the Whitney Bldg. New Orleans, La. by The Youngstown Steel Products Co., which represents The Youngstown Sheet and Tube Co. O. B. Ewing is district sales manager.

INDEPENDENT PNEUMATIC TOOL CO., of Chicago, manufacturer of "Thor" portable pneumatic and electric tools, will have a branch sales office at 220 West Seventh St., St. Paul, Minn., under managment of Joseph A. Bell.

TIMKEN ROLLER BEARING CO., Canton, Ohio, Steel and Tube Division, announces the appointment of three district sales engineers: Sherman R. Lyle, at Cleveland. William Earle Bryden at Chicago, and Alfred J. Kinnucan, at New York.

JESSE J. SHUMAN, inspecting engineer for the Jones & Laughlin Steel Corp., has retired after 46 years' service with the corporation, and 56 years in the steel business. Mr. Shuman is well known throughout the industry for his assistance in the framing of steel specifications and the writing of technical manuals on steel products.

UNITED CONCRETE PIPE CORP., Los Angeles, has announced the affiliation of L. A. Cline with the company as vice-

Three-mile Soil-Cement section of Guess Road, Durham County, North Carolina, was built in 1941, using the roadway soil on the site with 8 to 10% of portland cement added. In excellent condition after five years service.

One of the Soil-Cement base streets for residential traffic built in Columbus, Ga. in 1944. Many more are planned.

✓ CHECK THESE ADVANTAGES OF SOIL-CEMENT FOR LIGHTER TRAFFIC ROADS AND STREETS

✓ ECONOMY

Soil-Cement is economical—construction costs naturally are low because about 90 per cent of the required Soil-Cement materials is usually found on the site.

✓ ADAPTABILITY

With Soil-Cement you can transform old high maintenance cost gravel and stone roads, as well as earth surfaces, into strong, long-lasting pavements which give years of all-weather service without the need for frequent repairs.

✓ DURABILITY

The durability of Soil-Cement for lighter traffic roads, streets and airports has been proved by the years of service rendered by millions of square yards of Soil-Cement paving.

When you've checked these advantages of Soil-Cement and compared its cost and service with other paving materials intended for the same purpose, you'll see why Soil-Cement is the logical choice for your lighter traffic roads, streets and airports.

Send for free copy of *"Specifications for Soil-Cement Road and Street Construction,"* to help complete your secondary paving program. Distributed only in United States and Canada.

PORTLAND CEMENT ASSOCIATION

Dept. 9a-17, 33 W. Grand Ave., Chicago 10, Illinois

A national organization to improve and extend the uses of concrete
... through scientific research and engineering field work

Take advantage of the new features in design and construction techniques developed by International—improvements aimed at giving you better buildings—faster!

Along with complete variety of structural steel products and prefabricated buildings—engineered for adaptation to every building requirement and recognized for superior strength and quality—International offers you the benefit of vital improvements developed by our skilled and experienced engineers.

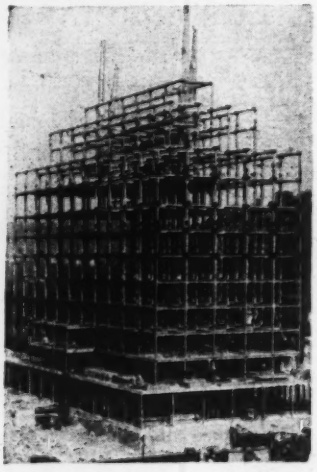
NEW TYPE WELDED CONSTRUCTION FOR BUILDINGS, for example,—perfected in furnishing steel fabricated products for the army and navy—saves up to 10% in initial steel weight—speeds construction—assures maximum strength—and eliminates construction noise.

Just name your problem! If it's a building for aviation, agriculture, commerce, or industry—you'll find a ready answer in International's standardized steel building products, bowstring steel roof trusses, steel deck fireresistant roofing that eliminates wood sheathing, steel windows and scores of other cost-and-time saving products.

Write for details. To get specific data quickly and accurately, tell us the purpose of your building use and approximate specifications and dimensions in your first letter.

● This alfalfa mill constructed of International prefabricated steel buildings and standardized units, demonstrates the adaptability of International Steel products.

Kentucky State Office Building, Frankfort, Ky., is one of the first all-welded, multi-story structures. It involves 1,624 tons of steel by International. International welded steel is equally practical for small buildings of a ton or less ●



INTERNATIONAL Steel Co.

STRUCTURAL STEEL
STEEL BUILDINGS
STEEL TRUSSES
BUILDING PRODUCTS

1522 EDGAR STREET
EVANSVILLE, INDIANA

ALSO MAKERS OF VAN KANNEL REVOLVING DOORS; FAIRHURST UNITFOLD PARTITIONS AND SCHOOL WARDROBES; HANGARS; HANGAR DOORS, AND ORNAMENTAL STEEL

president. General offices and main plant of the company are located at Baldwin Park, Calif.

THE PORTLAND CEMENT ASSOCIATION announces the appointment of R. W. Winters as manager, West Central offices, 1627 Dierks Bldg., Kansas City, Mo. Associated with Mr. Winters are the following district engineers: H. E. Frech, St. Louis, Mo., in charge of work in Missouri; Glenn Rippey, Oklahoma City, Okla., for Oklahoma; E. J. Mueller, Kansas City, for Kansas; C. W. Hiner, Omaha, for Nebraska; E. W. Thorson, Denver, for Colorado and Wyoming.

R. W. GILLMORE has been named manager of a new branch of the Allis-Chalmers Mfg. Co., Milwaukee, Wis., opened in the Claremount Hotel Bldg., Evansville, Ind. Mr. Gillmore has been associated with the Allis-Chalmers Indianapolis district office since October, 1935, as sales engineer. He served in the United States Navy from May, 1942, until October, 1945, when he was discharged from active duty as a lieutenant commander.

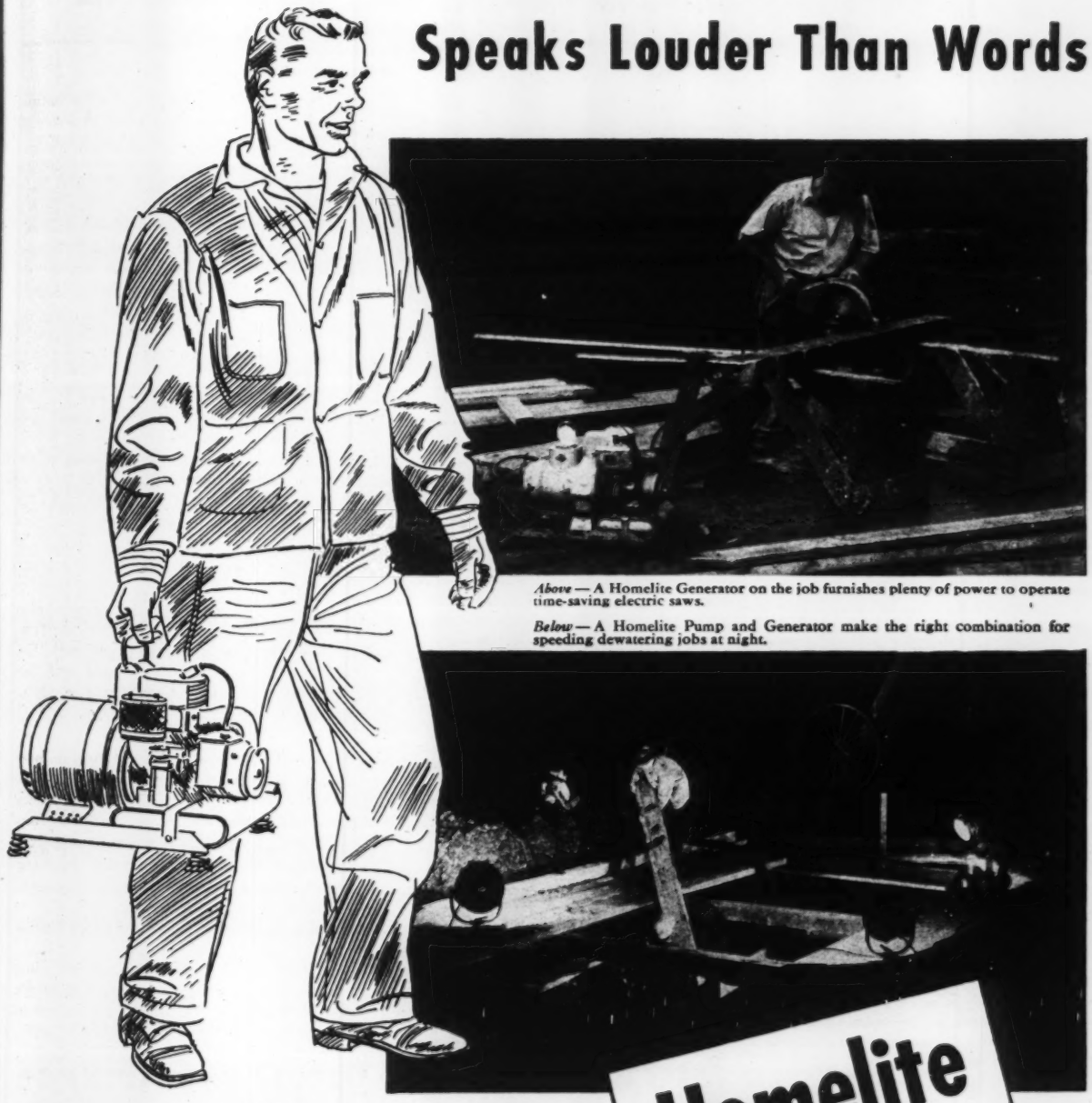
ROBINS CONVEYORS INC., Passaic, N. J., manufacturers of materials handling machinery, announces that its Philadelphia office has been consolidated with that of its parent organization, Hewitt-Robins Inc., at 401 North Broad Street, Philadelphia 8, Pa.

HAROLD C. CONNERS and Harold R. Fosnot have been named by the Graver Tank and Mfg. Co. to head the firm's Chicago area sales activities. Mr. Conners will handle steel plate sales while Mr. Fosnot will represent the Graver Process Equipment Division, specializing in water conditioning equipment.

PETTIBONE MULLIKEN CORP., according to E. J. Seifert, president, has acquired the Daniels Murtaugh Co., Cedar Rapids, Iowa, manufacturers of heavy duty dragline buckets ranging from 2 to 10 cu.yd. capacity. J. P. Murtaugh, who has been vice president and general manager of the acquired company, will represent Pettibone Mulliken on the West Coast. P. V. Larsen, who was sales engineer and secretary of the company, will represent Pettibone Mulliken in the coal fields.

ROBERT T. MILLER has been appointed manager of the industrial division of Masonite Corp. George Syversen will take over the duties of chief sales engineer. Donald E. Allen has been appointed advertising manager and director of public relations. Elmer J. Graebner has been promoted to sales manager of the Cellufoam products division.

Their Performance Speaks Louder Than Words



Above — A Homelite Generator on the job furnishes plenty of power to operate time-saving electric saws.

Below — A Homelite Pump and Generator make the right combination for speeding dewatering jobs at night.

We'd much rather show you Homelite Portable Gasoline-Engine-Driven Pumps and Generators *in action* than just talk about them. Action speaks louder than words.

So why not let us give you a free demonstration... any place you want it. See how fast a Homelite pumps, how quickly it primes itself, how easily it handles heavy liquids and solids. See all the cost-cutting operations you can put to good use on day or night work with steady electric power furnished by a handy Homelite Generator.

To get such a demonstration, free from all obligations, simply write. We'll have our nearest representative get in touch with you.

Homelite
CORPORATION
Port Chester, New York
Portable Pumps Generators and Blowers
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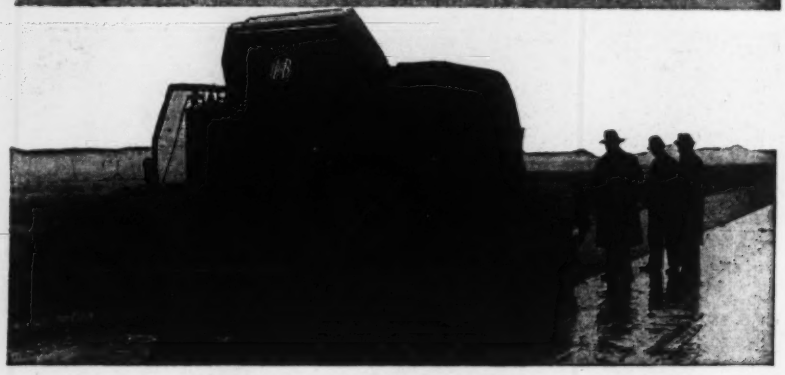

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The Moto-Paver does *the complete mixing and paving job,* and travels from one job to another under its own power. Paving speed is from 4 to 50 feet per minute, road speed up to 18 miles per hour. Mixing capacity 100 to 120 tons per hour. Bulletin MP-46, giving complete information and specifications, will be sent on request.

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Floor Treatments — Specification Book "B" covers concrete and wood floor treatments. It is subdivided into five sections: Integral hardeners; chemical hardeners, i.e., liquids that are brushed or swept over concrete floor; concrete dye; surface coatings, including rubber base floor coating, transparent sealer and non-slip mastic or covering; and wood floor preservatives, including varnish.—*Truscon Laboratories, Inc., Caniff and G.T.R.R., Detroit* 11, *Mich.*

Weldments — A 28-p. booklet describes engineering-welding facilities for designing medium and heavy weldments. Typical products include elevator cage frames, power unit components, girder beams, earthmoving equipment components, and dredge pump casings.—*Lukenweld, Inc.,* 279 *Lukens Bldg., Coatesville, Pa.*

Industrial Lubricating Equipment — Complete line of Graco industrial lubricating equipment is covered by 36-p. catalog including hand and air guns and pumps.—*Gray Co. Inc., Minneapolis* 13, *Minn.*

Hoist and Derrick — Crosby wire rope clips, blocks and sheaves, handiwinch, car pullers, hoists, steel derricks, material elevators, crane handling machinery, locomotive cranes, ditchers, pile drivers, revolver cranes, and marine deck machinery are pictured and described in 28-pp. catalog.—*American Hoist & Derrick Co., St. Paul* 1, *Minn.*

Steel Roof Trusses—Two 8-p. bulletins describe bowstring and freespan steel trusses. Pictures, specifications

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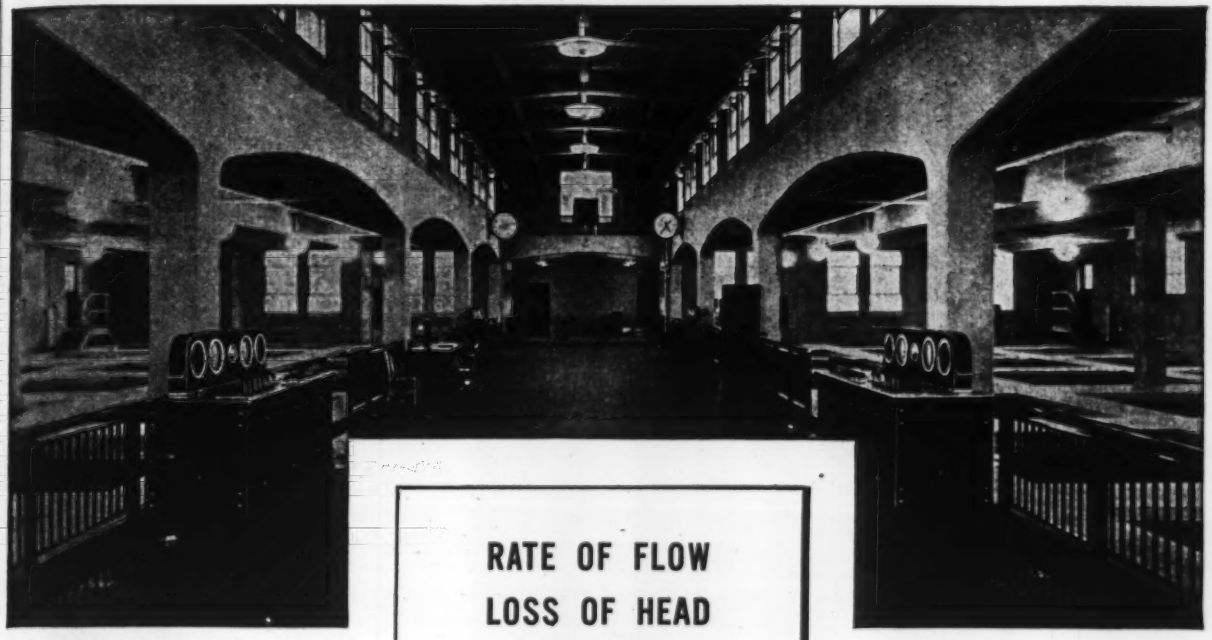

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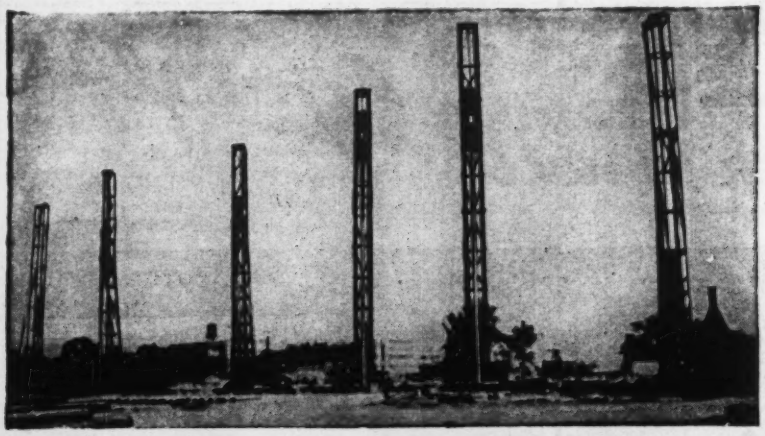

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and design tables are included. Company also has 20-pp. catalog on standardized sectional steel buildings which explains advantages and uses to which these buildings can be put.—*Geo. L. Mesker Steel Corp., Evansville* 8, *Ind.*

Arc Welding Electrodes — Applications, characteristics, physical and chemical properties and recommended welding procedures for more than 40 Murex electrodes are illustrated and described in 4-color, 92-pp. catalog. Engineering data section presents in simplified, tabular form information designed to assist welding engineer or shop foreman in planning and estimating welding job costs. Chart of AWS welding symbols and table of ASTM steels, along with electrode and preheating recommendations for each steel, are included.—*Metal & Thermit Corp.*, 120 *Broadway, New York* 5, *N. Y.*

Bodies and Hoists — Four new bulletins describe company's products. They are: BH-4534, heavy-duty dump bodies and twin cylinder hydraulic telescopic hoists; BH-4550, twin arm hoists for heavy-duty trucks; BH-4533, twin arm hoists and bodies for 1½ to 2½-ton trucks; and BH-4549, platform conversion hoists.—*The Heil Co.*, 3000 *W. Montana St., Milwaukee* 1, *Wis.*

Diesel Engines — Four-color, 64-p. pocket-size catalog gives detailed descriptions of five engines ranging from 84 to 275 hp. for automotive, industrial or marine use.—*Cummins Engine Co., Inc., Columbus, Ind.*

Grapples and Buckets—Bulletin No. 802, 4-p. gives suggestions for handling such materials as pulp wood, rock, scrap iron, and heavy trash, with helpful information with grapple devices available. Bulletin 804, 4-pp.

Financing Construction Equipment Purchases—Two 8-p. booklets describe special financing plan for construction industry. One features advantages to distributors of plan for financing purchases of equipment for resale and for rental; the other shows how contractors can arrange C.I.T. financing when buying equipment.—*C.I.T. Corp.*, 1 *Park Ave., New York, N. Y.*

Rod Selector Chart — Company's products and suggested applications are listed in this 18x23-in. chart, which also contains factual information for welders. Bonding and remelting temperature is given for each alloy, as well as Brinell hardness. Another column features strength in pounds per square inch of these low-temperature welding alloys.—*Eutectic Welding Alloys Corp.*, 40 *Worth St., New York* 13, *N. Y.*

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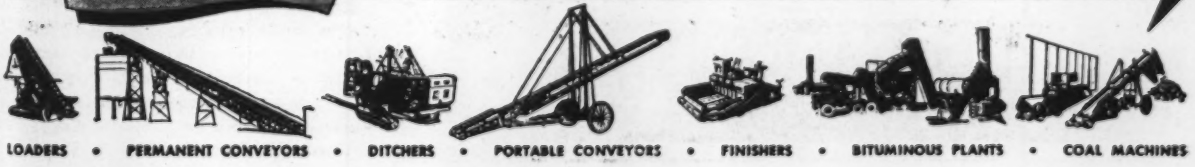

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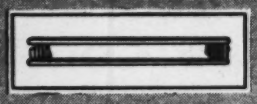

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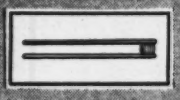

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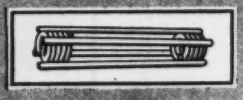

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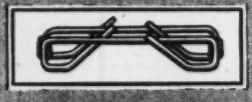

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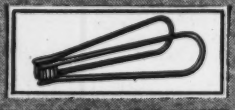

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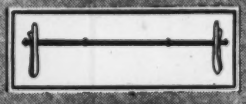

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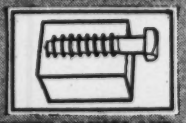

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Waterproofing — "The Truth About Aquella" gives 32-pp. of information on waterproofing in France's Maginot line plus data on current use and tests. Technical data are provided for architects, engineers, building and waterproofing contractors, distributors and dealers.—*Prima Products, Inc., 10 E. 40th St., New York, N. Y.*

Civic center outlined for Dayton, Ohio

The city planning board of Dayton, Ohio, recently recommended a new city-county government center with the nucleus consisting of a courthouse, county jail, safety building and juvenile center and said it would be centered on Wilkinson, Perry, Second and Third sts. in strategic relation to the downtown business center.

The recommendations, contained in a lengthy illustrated report, were turned over to city and county commissioners and the county building commission for consideration as part of the master plan for civic improvement adopted two years ago.

Community planning to be set up in Canada

A Community Planning Association of Canada is to be set up by representatives of the Dominion and provincial governments and other organizations, under the auspices of the Central Mortgage and Housing Corporation—federal government housing agency. The object is to foster public understanding of community planning, and to stimulate active participation.

C. D. Howe, Minister of Reconstruction, said that first requirements are accurate topographical and population surveys. He pointed out that during the war the number of industrial workers in Canada doubled and that this has had the effect of increasing the size of industrial areas disproportionately to other parts of the country.

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